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CONTENTS.

EDITORIALS:
Selling Electric Signs 115
Traveling Electric Signs 116
The Illumination of Pictures 116
A Notable Educational Agreement 116
State Commissions and Local Franchises 117
Motion Pictures for Educating Solicitors 117
Standard Metal Finishes 117
DEPARTMENTS:
Commercial Practice 127
Electric Sign Data 130
Electrical Construction 131
Dollar Wiring Kinks 135
Public Service Commissions 136
New Electrical and Mechanical Appliances 148
Latest Approved Fittings 154
Current Electrical News 155
Record of Electrical Patents 161
LEADING ARTICLES:
Electricity in Silk Mills 121
Compensation Laws and Electric Power.—
By G. D. Crain, Jr. 127
A Method of Conduit Construction.—By H. E. Weightman 131
The Electrolytic Deposition of Metals 138
Mining Plants in Europe 141
Convention of the Independent Telephone Association of America 145
MISCELLANEOUS:
Lynn Section Meeting 118
Program of Meeting of Western Inspectors 118
New York Automobile Show 118
Chicago Jovian Meeting 118
William H. Merrill 119
Annual Meeting and Dinner of the Western Society of Engineers 120
New Business at Minneapolis 128
Commercial Inspection Bureau of the Boston Edison Company 128
Reading Company Secures Ice-Making Load 129
Advertising That Brings Power Business 129
Commonwealth Edison Company Makes Big Increase in 1913 129
Selling Electric Signs 130
Standard Metal Finishes 132
A Reel for BX Conductor.—By E. M. Raetz 133
Among the Contractors 133
Detecting a Theft of Current.—By E. V. Smith 133
The Electrical Contractors' Association of Wisconsin 134
The Lighting of Pictures 137
Harvard and Technology 137
Multiplex Radiotelegraphy 144
National Indefendent Telephone Association Convention .. 147

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SELLING ELECTRIC SIGNS.

Regardless of what the individual sales records of sign manufacture might indicate, it is certainly apparent that the electric-sign industry has reached a gratifying position in this country. Merchants in the smallest as well as the largest towns have realized that electric advertising is not alone the most effective form of advertising commercially, but it is the highest class of advertising procurable. While vulgar, garish and ill-designed signs are to be seen in some cities, this is not the fault of electric advertising, but rather it is the fault of those directly concerned with the individual signs which offend. If the man who buys the sign will permit himself to be guided within reason by the man who sells, and if the salesman will counsel the buyer to erect the best and most fitting for the especial purpose in hand, electric advertising becomes at once the cheapest advertising, the most up-to-date, the most artistic and the most dignified.

Merchants realize to a greater extent than ever before the value of electric advertising, as evidenced by the large and increasing number of signs in use, and yet there has hardly been any comprehensive attempt made to improve the relationship between sign manufacturer, central-station company and user. In view of the progress which has been made without this co-operation, it seems that there are unlimited possibilities for improving conditions in this field.

Electric signs are about the easiest commodity on the market to sell, provided the salesman is equipped with definite data of a character that will interest the prospective user. The market for electric signs is almost without limit and the demand is ever increasing. In spite of this, however, the complaint is heard on many sides, particularly from central stations, that the lack of definite information, with which it is possible to equip central-station salesmen in their fight for this class of business, has been the cause of somewhat retarding sign development.

It is with the hope of relieving to some extent these conditions that we are inaugurating in another department of this journal a sign section, in which will be published each week a sketch or photograph of some original or noteworthy sign that may be used by central-station or sign salesmen in interesting prospects in similar lines. Data will be given regarding the equipment of the sign, color and flashing effects, approximate cost, wattage, and such other information as could well be used in interesting prospective purchasers. These data are being published in standard size, so that they can be

cut from the page and made the basis of a sign-data book, which seems to be much desired in this industry.

TRAVELING ELECTRIC SIGNS.

Too little use is being made of traveling electric signs, considering their commanding interest to the general public. For many years advertisements have been carried about the streets of our cities and towns during the daylight hours on teams, automobiles and even the backs of patient burden-bearers decorated with clothing and other adornments. But only a beginning has been made in this sort or publicity. There is little question that such applications of electric signs will pay handsomely in the present undeveloped state of the business, for the improved electric lighting of streets and display windows has changed the habits of the people in thousands of communities, and has led to an increased amount of visiting of business districts after working hours but little anticipated in years past.

The good points of the fixed or flashing electric sign apply with even greater force to the moving display. Thanks to recent storage-battery development, such signs can be turned to account on almost any vehicle and at a cost which is certainly small in proportion to the interest aroused. It is especially easy with electric vehicles. There is no reason why the striking effect secured by electrically lighted outdoor displays in parades should be confined to these rare occasions, and the merchant and the central station who take up this matter in earnest, co-operating with the sign manufacturer when untried paths are to be followed, will reap a well deserved reward for their enterprise.

THE ILLUMINATION OF PICTURES.

Attention was called in these columns in the issue of December 13, 1913, to the frequent lack of proper illumination of paintings in art galleries. An instance was pointed out in which this condition had been avoided. This instance was a large art exhibition in the city of Cleveland. The fact that a study of scientific principles was made in connection with that installation may be credited to a prominent member of the Illuminating Engineering Society.

Some years ago Mr. Bassett Jones, Jr., called the attention of the Society to the effect of the color and direction of light upon the appearance of works of art and how greatly the meaning could be emphasized or obscured by correct or faulty lighting. Last winter Mr. M. Luckiesh devoted considerable attention to this subject and made addresses in a number of our large cities. In his home city, Cleveland, a direct result of this was apparent, and when preparations were made for the exhibition above referred to, scientific principles were applied through his direct co-operation and that of the Engineering Department of the National Lamp Works. A description of the Cleveland installation was given in the issue above mentioned.

Meanwhile experiments along a somewhat different line were being made in Chicago. One of the rooms of the Artists' Guild in that city was fitted with an installation of indirect lighting which utilized a combination of mercury-vapor and tungsten lamps. A brief description of this installation will be found elsewhere in this issue. Attention may be called here merely to the fact that this installation has been very satisfactory from the standpoint of color values, and many artists have expressed their appreciation of the fact that this installation brings out the entire range of colors much better than is usually achieved under artificial illumination. This is especially true of paintings in which greens and blues have a prominent part. This installation is somewhat handicapped by an inadequate power supply. Electric current is furnished from a plant in a neighboring building and a limited capacity of the mains, resulting in a fluctuating voltage, makes it difficult to realize the most perfect results. As an experiment, however, it amply demonstrates the advantages of proper color values and elimination of glare in lighting pictures.

A NOTABLE EDUCATIONAL AGREEMENT.

In an agreement signed last week between Harvard University and the Massachusetts Institute of Technology one of the most important co-operative steps in the history of American education is evidenced and engineering instruction and research were thereby placed upon a plane which should yield results of great public benefit in the years to come. By the terms of this intellectual treaty the mechanical, electrical, civil, sanitary and mining engineering faculties of the two institutions are to be centralized so that a professor, assistant or associate professor in either institution becomes *ex officio* a member of the staff of the other; the laboratories and equipment of the Institute will be used by engineering students at Harvard as well as by Technology men; and the funds of the University will be applied in large degree to the maintenance of these facilities. All this is to be accomplished without the sacrifice of individuality on the part of either institution; each will continue to have jurisdiction over its courses and students upon an independent basis, and yet there will be avoided that duplication of equipment and consequent waste in investment which in the last analysis would be economically unjustified in two institutions of similar aims located in the same neighborhood.

With the completion of the new buildings of the Massachusetts Institute of Technology at Cambridge in the next two or three years and the coordination of resources promised by the agreement, a far reaching stimulus to engineering education and research should be felt not only within but well beyond the present spheres of influence of these noted institutions. It is appropriate that engineering institutions should furnish such an example of efficiency in utilizing resources.

STATE COMMISSIONS AND LOCAL FRANCHISES.

In 1819 the Supreme Court of the United States handed down a decision in the celebrated Dartmouth College case, which established priority of the rights conferred through a charter granted in Colonial times over those conferred by an act of the State Legislature of New Hampshire. It has often been maintained in consequence of this decision that no state legislature can annul a charter whose provisions do not specifically provide for such control, but recent developments have shown this point of view to be untenable. It may be mentioned here, in passing, that the case referred to was decided by a divided court and one which was influenced more largely by reasons advanced outside of the court than during its sessions, and that partizan political considerations were largely involved in the dispute.

There is little reason why our Supreme Court should in a later generation be influenced by this precedent, and recent decisions would indicate that the precedent no longer is controlling. It has recently decided that the provisions of a charter granted to the Louisville & Nashville Railroad in 1850 specifying maximum freight rates do not act to prevent control of rates by the State Railroad Commission. In the deciding opinion in that case, rendered by Justice Hughes, it is stated that notwithstanding the contention of the irrevocability of a charter, the repealability of charters has been frequently asserted and sustained by the Supreme Court. It is definitely stated in this opinion that "a statute permitting the State Railroad Commission to fix rates potentially repealed that part of the charter which named rates."

In the Kansas Gas case, recently decided, the Supreme Court holds that the Public Utilities Commission of Kansas may revise existing rates of the utility corporation regardless of previous contracts with the municipality contained in its franchise. Whether a similar ruling would be made in other cases depends largely upon the constitution and statutory laws of the particular state in which such a case arises. In Wisconsin the legislature has repealed local franchises which conflict with control by the state commission. In Ohio the United States Supreme Court sustained legislation which was in conflict with a franchise previously given by the city of Hamilton. This is in conformity with the Ohio constitution.

In other states it is probable that such rights of the state legislature would not be sustained. In Michigan, for instance, the state has conferred upon municipalities the right to confer franchises by popular referendum, and it is thought by many that the state has no power to interfere with the terms of such franchises. A similar doubt exists in Illinois and certain other states.

It is thus evident that every case of this kind must be considered upon its own merits and with reference to the provisions of local laws and state constitutions and the interpretation which has been put upon these by the courts. In this connection, as in many others, uniformity will not be found throughout the country, since the question involves principles in regard to which different state constitutions have different provisions.

MOTION PICTURES FOR EDUCATING SOLICITORS.

New applications of the motion picture come to light weekly, and one of the latest examples of the commercial utilization of the cinematograph was given a few days ago in New York in connection with the training of bond salesmen employed in the work of raising funds for the development of the Montana Power & Light Company. About one hundred salesmen were thus given a first-hand idea of the properties covered by the bond issue and were prepared to talk more intelligently upon their prominent features to prospective purchasers. Pictures were shown of the hydraulic conditions on the Snake and Great Rivers, and the president of the company discussed in detail the present state of the properties and their possibilities under further development. There is no question that latent possibilities of this sort also exist in connection with the training of central-station employees in commercial and technical tasks. The right and wrong ways to approach a prospective customer, the steps required in canvassing for electric service, house-wiring methods, and plant-operation details can all be shown in motion-picture form to the lasting benefit of the employees no less than the general public. There is a feeling among many central-station executives that more intensive training of employees especially charged with meeting the public is needed, and we believe that the motion-picture machine is destined to be turned to much more general account in this direction in the near future. As a matter of fact, several large merchants and industrial corporations are highly pleased with the results already achieved in thus securing an educated enthusiasm on the part of their representatives.

STANDARD METAL FINISHES.

It will be a great convenience to the electrical contractor and to many other persons as well if the finishes given to the metals used in electrical work, such as fittings and fixtures, could be standardized. The number of finishes now on the market is legion and the electroplaters and others are turning out new ones every week. By establishing a definite line of a few dozen types of finish which would be everywhere recognized by a code designation and which could be furnished by regular supply men and platers, simplicity in ordering would be very much furthered on the part of the contractor and facility in filling orders increased for the metal finisher.

The National Electrical Contractors' Association has a committee working on this subject and this committee is in a position to greatly help the industry if it has the support of individual contractors over the country. It is now making a proposal to the membership along the lines above indicated.

Lynn Section Meeting.

On January 7, E. E. F. Creighton, professor in Union College, delivered a lecture on "High-Frequency Phenomena," before the Lynn Section of the American Institute of Electrical Engineers. The lecturer discussed electrical waves and surges, and stated that the action of an electrical wave is now well understood, being mathematically simple as compared with the action of a water or ocean wave. By means of charts and special apparatus, Professor Creighton illustrated electrical-wave effects in a number of different ways, and his personal research work in connection with the protection of electrical apparatus served as the basis for a well-delivered and illuminating address.

The question of lightning arresters was dealt with, and some practical experiments were made to illustrate how within but a few years continuity of service has been secured even in contention with the most violent atmospheric disturbances. For many years the largest electrical manufacturers were much baffled in the matter of lightning arresters, and experimented in every direction, but at length by the use of suitable shunted assistance almost absolute protection may be obtained.

Professor Creighton was assisted in his demonstrations by Mr. Frank, of Schenectady. The attendance at the lecture was very large. Chairman E. R. Berry announced that the annual banquet will be held on January 24, in the new dining room of the American House, Boston. The statement was also made that the membership of the section is now 600.

Program of Meeting of Western Inspectors.

The ninth annual meeting of the Western Association of Electrical Inspectors will be held at the new Hotel Gibson, Cincinnati, O., on January 27, 28 and 29.

Sessions will begin each day at 10 a. m. At the opening session on Tuesday morning, there will be an address of welcome by the mayor, F. S. Spiegel, to which H. B. Long will reply. The presidential address will then be delivered by Ben W. Clark. Reports will be made by William S. Boyd for the Executive Committee, the secretary and the treasurer. Reports of committees to be presented at this session include the following: "National Electrical Code," by F. D. Varnam; "Outside Wiring." by M. E. Cheney; "Theater Wiring," by F. L. Lucas; "Show-Window and Display Lighting," by E. P. McGough. In the evening there will be a smoker.

At the session on Wednesday morning Frank R. Daniels will present the report of the Committee on Electric Traction Systems. C. H. Anderson will present a paper on "Practical Car Wiring," and R. W. Shenton will speak on "The Incandescent Lamp and Its Circuit." This will be followed by a general discussion of electrical-inspection problems. In the evening there will be a banquet, L. T. Milnor acting as toastmaster.

At the session on Thursday morning there will be committee reports as follows: "Installation and Operation of Induction Motors," by K. W. Adkins; "Architects' Specifications," by F. H. Moore; "Signal Systems," by Frank S. Anderson; "Rubber-Covered Wire," by V. H. Tousley. In the afternoon there will be a tour of inspection, which will include the pumping stations and filtration plants of the new Cincinnati water works.

A special car will leave Chicago at 11:45 p. m., on January 26, on the Pennsylvania Railroad, for the convenience of those going to the convention from or by way of Chicago. Reservations in this car can be secured by applying to Secretary William S. Boyd, 76 West Monroe Street, Chicago. On Monday afternoon arrangements have been made for a series of tests at the Underwriters' Laboratories, in Chicago, and a theater party has been proposed for that evening.

New York Automobile Show.

The annual Automobile Show was held in the Grand Central Palace, New York City, January 3 to 10. A number of electric vehicles were exhibited at the show, including the following: Anderson Electric Car Company, Detroit, Mich.; Baker Motor Vehicle Company, Cleveland, O.; Ohio Electric Car Company, Toledo, O.; Rauch & Lang Carriage Company Cleveland, O.; Ward Motor Vehicle Company, New York, N. Y.; Waverley Company, Indianapolis, Ind.

Among the exhibitors of accessories were the following: Apple Electric Company, Dayton, O.; Dean Electric Company, Elyria, O.; Detroit Electric Appliance Company, Detroit, Mich.; Joseph Dixon Crucible Company, Jersey City, N. J.; Edison Storage Battery Company, West Orange, N. J.; Electric Storage Battery Company, Philadelphia, Pa.; Holtzer-Cabot Electric Company, Brookline, Mass.; International Acheson Graphite Company, Niagara Falls, N. Y.; H. W. Johns-Manville Company, New York, N. Y.; Jones Electric Starter Company, Chicago, Ill.; Ward Leonard Electric Company, Bronxville, N. Y.; National Metal Molding Company, Pittsburgh, Pa.; North East Electric Company, Rochester, N. Y.; Pyrene Manufacturing Company, New York, N. Y.; Rushmore Dynamo Works, Plainfield, N. J.; Splitdorf Electrical Company, Newark, N. J.; United States Light & Heating Company, New York, N. Y.; Western Electric Company, New York, N. Y.; Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; Westinghouse Air Spring Company, New York, N. Y.; Westinghouse Machine Company, Pittsburgh, Pa.; Willard Storage Battery Company, Cleveland, O.; Vesta Accumulator Company, Chicago, Ill.

Among the accessories exhibited was the Hartford electric brake, applicable to all types of cars. One great advantage of this brake is that it can easily be placed on an automobile, the preferred location being under the rear seat, bolted to the rear of the frame or under the hood. Cables are led to the brake-band operating levers on the car, but from which have been disconnected the ordinary rod or rods that attach to the emergency brake lever. The electric brake is designed as an emergency brake that will act quickly and with certainty.

The electric vehicles exhibited were very attractive and seemed to be built along more graceful lines than ever before.

Another British Railway to Electrify.

The Tilbury Line in England, which was recently acquired by the Midland Railway, the most extensive steam railroad in England, is to be electrified. This was decided by the directors of the Midland system after receiving the report of Sir William G. Granet and other officials of the road, after their recent trip to the United States to inspect electrification projects here.

Chicago Jovian Meeting.

Edward N. Lake, with the Stone & Webster Engineering Corporation, Chicago, delivered a highly interesting stereopticon lecture before the Chicago Jovian League on January 12. Views of the Keokuk hydroelectric development were shown principally, although construction views of several other important projects engineered by Stone & Webster were shown. The Chicago degree team volunteered to assist the Milwaukee Jovians at their rejuvenation on January 16.

Joint Meeting in New York.

There will be a joint meeting of the New York Electrical Society and the New York Companies Section of the National Electric Light Association at the Edison Auditorium on the evening of Monday, January 19.

Elihu Thomson will lecture on "The Wireless Transmission of Energy."

William H. Merrill.

The wide extent and excellence of the work of the Underwriters' Laboratories, Incorporated, in eliminating the fire hazard, are known to the readers of this publication. From a very meager beginning a comparatively few years ago, the laboratories have been developed into a fine organization housed in a substantial fireproof building covering a great area and devoted to the testing of materials of a fire-resisting, fire-preventing and mechanical and electrical nature of every description. While a great many articles and materials other than those connected directly with the electrical industry are now tested at the laboratories, its inception was wholly with respect to reducing the electrical fire hazard.

The genius of the enterprise known as the Underwriters' Laboratories, Incorporated, is William H. Merrill, founder of the institution and manager since its inception. Mr. Merrill was born in New York in December, 1868. He graduated in 1889 from the Massachusetts Institute of Technology. Shortly thereafter he was employed by the Boston Board of Fire Underwriters in the capacity of chief electrical inspector. He came to Chicago in 1893, taking the post of electrician with the Chicago Underwriters' Association. While still serving in this capacity he became associated with the Western Insurance Union in 1894, and organized the Underwriters' Bureau of Fire Protection Engineering.

Mr. Merrill has always been an eager and active exponent of fire-protection engineering. He assisted in the organization of the Electrical Committee of the Underwriters' National Electric Association and participated in the conference which resulted in the National Electrical Code. He has been secretary, treasurer and president of the National Fire Protection Association. In every activity with which he has been connected he has shown great executive ability and remarkable talent for organization. His correspondence sparkles with wit and humor, he is a brilliant conversationalist and an interesting and entertaining public speaker. He is possessed of the faculty of being able to understand and estimate the qualities of the men upon whom he must depend for the carrying out of many details of his work, and his wisdom in this direction has enabled him to surround himself with a fine organization of the best fire-protection men available in the country today.

When he began his work in Chicago there were many problems confronting the fire-insurance interests. Standards for wiring were in a bad condition, and one of the first steps made in the right direction was in securing the co-operation of the municipal department of Chicago in establishing a safe standard for electrical wiring and electrical apparatus. The opposition upon the part of electricians, manufacturers, insurance agents and owners which was manifested in the early days, seems almost incredible at the present time. Mr. Merrill secured the co-operation also of the Chicago Underwriters' Association whose regular building inspectors were detailed to assist him in his inspection work, these men receiving their entire electrical education from him. This educational work included lectures and practical demonstrations covering the detection of dangerous wiring and apparatus, with suggestions regarding the application of the proper safeguards.

William H. Merrill,
Manager of the Underwriters' Laboratories.

In was in 1894, when this work was going along so merrily, even if it was the subject of considerable opposition, that Mr. Merrill organized a laboratory under the joint auspices of the Western Insurance Union and the Chicago Underwriters' Association. A success from the beginning, the importance of the work was speedily recognized and so rapidly did the opportunities for service develop that both buildings and equipment have grown continuously and are still in a period and process of expansion.

Manhattan Electrical Supply Company of St. Louis Sales Force Attend Franklin Dinner.

The sales force of the Manhattan Electrical Supply Company, of St. Louis, Mo., were tendered a dinner at the Missouri Athletic Club on Friday, January 2, by Charles W. Brainerd, St. Louis manager of the Franklin Electric Manufacturing Company, of Hartford, Conn. The object of the dinner was to get in touch with the salesmen and give them an opportunity for thoroughly understanding the methods of manufacture and the operating characteristics and efficiency of Franklin Mazda lamps. The methods of creating new business and handling contracts were discussed from every angle. The meeting was a success in every sense and developed an intelligent and enthusiastic appreciation of the handling of Franklin Mazda lamps, which are made at the company's own factories at Hartford and Middletown, Conn. Covers were laid for 25. Those attending the dinner were the host and C. R. Baldwin, O. W. Stone, John H. Surman, C. W. Farnan, V. E. Mesplay, W. A. Ward, C. A. Smith, G. L. Thiemeyer, H. F. Wilker, W. Auld, J. A. Riddick, R. P. Lehnherr, W. C. Becker, William Kuhn, John Tracka, W. W. Dancy, John E. Leahy, Fred Hauck, J. A. Grace, H. B. Hewitt, G. W. Underhill, E. H. Peebles, H. H. Snyder, Albert Uhl, J. L. McCarron. G. H. Herbert, Earl Brunk, Harry E. Hawkins, William Ziegelmeyer, R. L. Sparks.

Wireless Club In Louisville.

The Falls City Amateur Wireless Club has been organized in Louisville, Ky., with Wallace W. Smith, 190 Pennsylvania Avenue, as secretary. The object of the club, as announced, is to bring together wireless experimenters in and near Louisville. The club expects to enroll everybody interested in this phase of electrical work within a radius of 150 miles of Louisville. A club room will be fitted up, and in connection with it a high-power long-distance outfit will be installed.

Annual Meeting and Dinner of the Western Society of Engineers.

The forty-fourth annual meeting and dinner of the Western Society of Engineers was held on the evening of January 7 at the Hotel LaSalle, Chicago. This meeting was one of the best attended annual gatherings ever held by the Society, 265 members and a few guests sitting down to the dinner.

Directly after the banquet Retiring-president Reichmann called upon Secretary J. H. Warder to present a summary of his annual report. Mr. Warder briefly referred to the strong position of the Society both in membership and in finances, and briefly touched on some of its more important activities during the past year.

Mr. Reichmann then made his retiring address as president. He announced the award of the Octave Chanute medals for the best papers presented before the Society in the year 1912 as follows: Mechanical and electrical engineering, to W. L. Abbott, for the paper entitled "The Northwest Station of the Commonwealth Edison Company"; general engineering, Onward Bates, for the paper entitled "Arbitration"; civil engineering, D. W. Mead, for the paper entitled "Cause of Floods and Factors That Influence Their Intensity."

Mr. Reichmann reviewed some of the work carried on by the Society during the past year. As a result of the effort made by the Society's officers, a 100-foot standard of length has been placed in the City Hall for reference. An effort is being made to secure new and larger quarters for the Society. Mr. Reichmann spoke of the advanced recognition being accorded to engineers and urged bringing all engineers in Chicago and contiguous territory into affiliation with the Western Society of Engineers.

He then announced the results of the letter ballot on election of officers as follows: E. H. Lee, president; B. E. Grant, first vice-president; Ernest McCullough, second vice-president; G. F. Gebhardt, third vice-president; C. R. Dart, treasurer; H. S. Baker, trustee for three years.

President-elect Lee assumed the chair at this point and made a gracious address, expressing his pleasure that his election had not been without contest. He believed that a contest for the presidency showed virility in an organization. Referring to engineering in general, he said that to the engineer is due in probably greater measure than to any other the foundation of our present progress. He compared engineering with other professions and claimed that credit must be given to engineers for paving the way for civilization. Engineering being based on solid unassuming work, it has suffered because too little time has been available for giving it proper publicity.

E. H. Lewis, dean of Lewis Institute, Chicago, was then called upon to act as toastmaster. This Dr. Lewis did with his usual humorous and cordial manner.

Dean Mortimer E. Cooley, of the University of Michigan, then presented the chief address of the evening entitled "Factors Determining a Reasonable Charge for Public Service." Dr. Cooley said he spoke on the subject from his experience of 15 years with the valuation of public utility properties. The fact that there is any question in regard to the determination of reasonable charges is due to the ignorance of the public on the many factors that must enter into the problem. The education to bring about a better public feeling is simple; the public is always ready to act in a fair and reasonable manner if it understands the problem properly. Officers of utility corporations now realize that the former unfriendly attitude of these corporations is largely responsible for the present hostile public opinion toward them. Dr. Cooley dwelt briefly on the advantages to the public in any community of having a single utility in each class to serve it at reasonable charges.

The question of what is a reasonable charge is not always the same, since it depends greatly on local conditions. Primarily a reasonable charge depends upon the service rendered. It must provide for (1) return on the capital investment; (2) operating expenses; (3) depreciation, and (4) a sinking fund. Dr. Cooley took up each of these items in considerable detail. He said that capital must be induced to invest by the definite assurance of fair return on the investment. He described at length the many features of a utility's organization due directly to capital. One of the principal causes of failure of the public to understand the utility side of the question is because it does not understand the elements that enter into the cost of the utility. Many of these are entirely unknown to the public; for example, the preliminary investigation of the feasibility of undertaking the project, financing of the project if it has been found feasible, the engineering work, both design and supervision. The actual construction work is about the only thing that the public actually sees and appreciates. Dr. Cooley thought that the newspapers should be called upon to educate the public on these matters because they are themselves public utilities. Among other factors that enter into the cost, which are self-evident if properly analyzed but usually are overlooked, are profits to the general contractor or constructing engineer, insurance during construction, taxes during construction, interest on the capital required during construction, and ample working capital.

Aside from meeting operating expenses, which is readily comprehended, there is an element of cost which is not usually understood. During the early development of a utility as a going concern there are likely to be extra expenditures in getting business and probably also deficits. These factors are in the class of intangible values of a utility concern. Dr. Cooley referred briefly to the importance of depreciation, explaining the factors that influence it and showing how it differs from maintenance and ordinary repairs. If depreciation is not allowed for, a sinking fund must be provided. Another feature usually overlooked is that the financing of a utility through the ordinary banking interests almost invariably involves discounts on bonds. In conclusion, the speaker referred to the considerable overhead charges that are involved in the organization and construction of any utility which vary upwards of 20 per cent, in some cases even running as high as 60 per cent of the capital investment.

The closing address of the evening was of a very humorous nature and was presented by S. E. Kiser, of the *Chicago Record Herald*. It was entitled "Alternating Currents," which is the title of a department edited by Mr. Kiser.

Dinner to A. C. Terry.

The Commercial Efficiency Promoting Association of the Western Union Telegraph Company gave a banquet on January 1 at the Fort Pitt Hotel, Pittsburgh, Pa., in honor of A. C. Terry, district commercial superintendent. Thomas Gosden, president, acted as toastmaster. Addresses were made by E. A. Baird, vice-president; T. R. Jones, secretary; George S. Walters, Samuel Bell, George F. Sladtmiller, W. W. Kelser and L. L. Leith. The music was by the Western Union Commercial Orchestra.

Frisco Strike Settled.

The trouble between the St. Louis & San Francisco Railroad and its telegraphers, mentioned in the issue of January 10, was finally settled by a grant of concessions by the company. The telegraphers will be given an increase of from 5 to 6.5 per cent in pay, a nine-hour working day, extra pay for overtime, and double pay for Sundays.

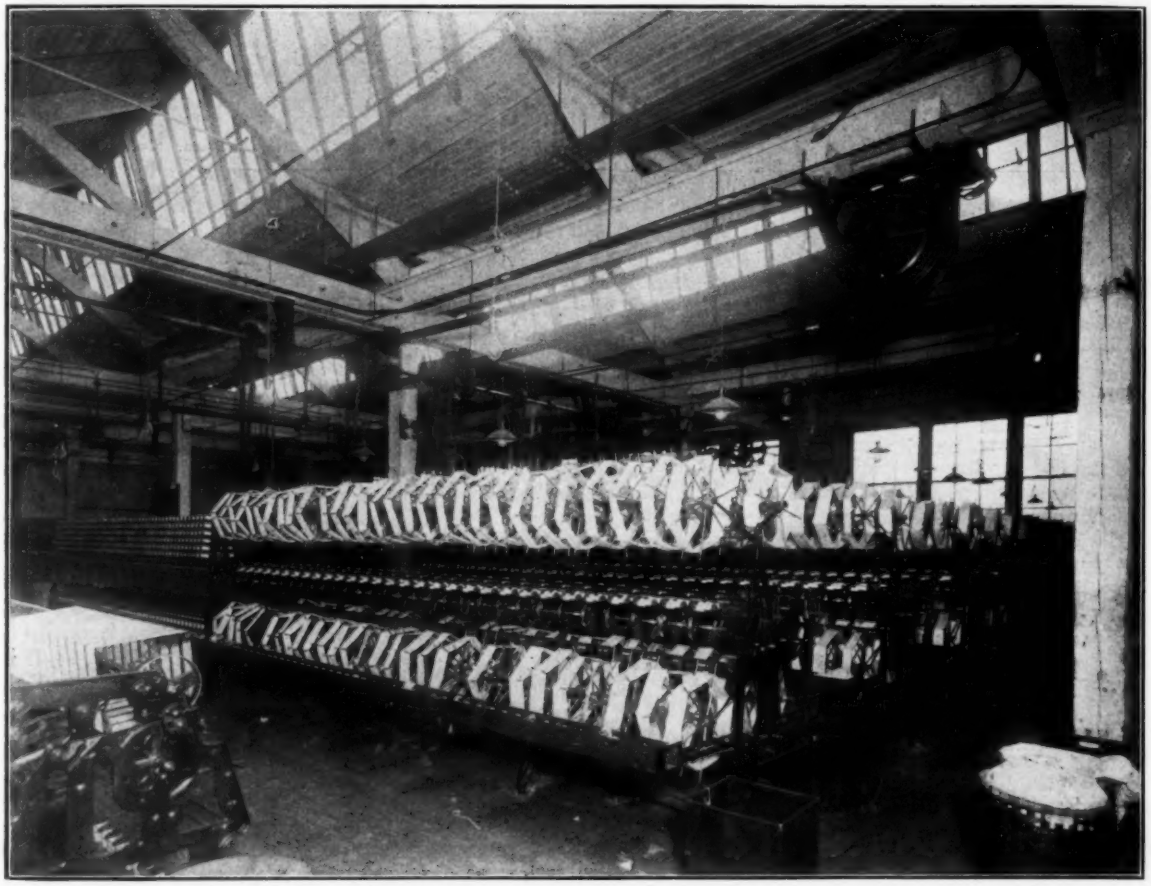
Boston Wireless Club Elects Officers.

The Wireless Club at Massachusetts Institute of Technology, Boston, has elected officers for the current year as follows: president, A. R. Morton; vice-president, D. R. Husted; secretary, R. E. Curtis; treasurer, H. W. Lamson. At a forthcoming joint meeting with the Wireless Clubs of Harvard and Tufts College, D. F. Comstock will make an address.

Electricity in Silk Mills.

When it is considered that only about one-tenth of the silk mills in this country are using electric service some idea of the opportunities offered for the introduction of electricity in this industry can be obtained. The accompaning article discusses the advantages of electric motor drive, both group and individual, and gives operating data on a number of mills purchasing power.

Silk manufacturing is one of the oldest, most interesting and important branches of the textile art. Statistics show that in 1850 the value of the products of the American silk industry was $1,800,000, while in 1905 the value of finished silk goods in this country was $116,500,000; there were in service 49,000 power looms on broad weaving and 9,000 looms on narrow fabric work, 1,300,000 throwing spindles and 1,150,000 accessory spindles. About 23,000,000 pounds of raw silk were imported into the United States in the year ending June 30, 1910, and in 1913 it is estimated the import figure reached 50,000,000 pounds. This vast volume of raw material is handled by about 1,000 manufacturers, and when it is realized that but about 100 are as yet using motor drive, some conception of the opportunities offered for the introduction of electric service in this industry can be obtained.



Double-Deck Winding Machines Driven by 25-Horsepower Motor.

The progress of silk weaving became marked by the invention of the Jacquard loom in 1804. Before the arrival of Jacquard, figured silk weaving was a complicated labor, requiring almost infinite patience for its prosecution. Every loom required the services of at least two attendants. The advent of the Jacquard loom reduced the labor requirements by 50 per cent and the character of the work was made much easier. The next most important step in silk manufacturing was the advent of power-loom weaving which revolutionized most of the processes of silk manufacture. The changes wrought have brought silk fibres within the reach of a small purse, with the result that the demand on silk producing countries has been much increased. Lately the introduction of electric service has again revolutionized silk manufacturing, as shown by the testimony of mills using electricity. In the work of securing the utmost output of which a given plant is capable electricity stands in the front rank of auxiliary agencies. Wherever it has been introduced it has either increased or maintained the maximum rate of machine production better than was formerly possible with purely mechanical methods, provided the installation has been designed and placed in service under the supervision of an experienced engineer.

Cycle of Operations.

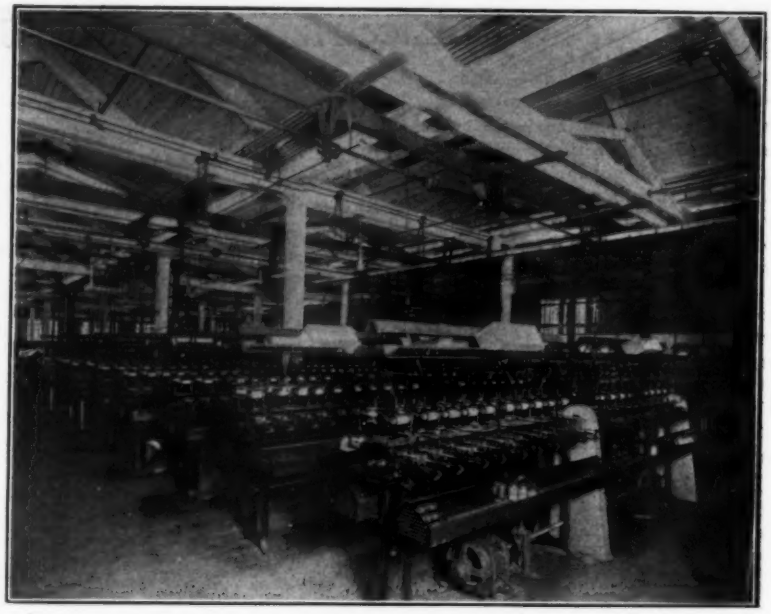
Silk is the product of the caterpillars of various species of moths, natives of India, China and Japan. This caterpillar, or silkworm, feeds on the leaves of the mulberry tree, and takes about 30 days to attain maturity, during which time the worm casts its silk sev-

eral times, and after 30 days begins to spin its cocoon.

The extraction of the silk from the cocoon cannot be performed by machinery, and is confined almost entirely to the countries in which the silkworm is cultivated.

In the manufacture of silk products there are seven chief divisions of the work: throwing, dying in the skein, winding, weaving, dyeing in the piece, printing and finishing. Some few plants carry on all of these operations but they are exceptions, the usual operations being throwing, spinning and weaving. There are also a great many plants spinning and weaving only, purchasing the skein silk from plants devoted exclusively to throwing.

The raw silk as it is imported from China or Japan is in a condition of great fineness and delicacy and it is therefore necessary to subject it to the series of operations called throwing before further working the material. Throwing includes winding, cleaning, doubling, twisting, rewinding and reeling the fibre into yarn of increasing substantiality. Single silk is produced by giving the single thread a twist to add strength and firmness to it. Tram silk consists of two or more threads thrown sufficiently together to hold by a twist of one or more turns per inch. The degree of twist varies according to the specific article produced. Organzine is formed of two or more singles, according to the thickness required twisted together usually in a direction contrary to that of the singles of which it is composed. Sewing silk and machine twist are manufactured from two and three strands respectively. The last process before reeling is stretching. The stretching machine evens up the thread and gives it firmness and uniformity in size. After stretching the silk is transferred to a reel and wound into skeins suitable for use of the dyer.

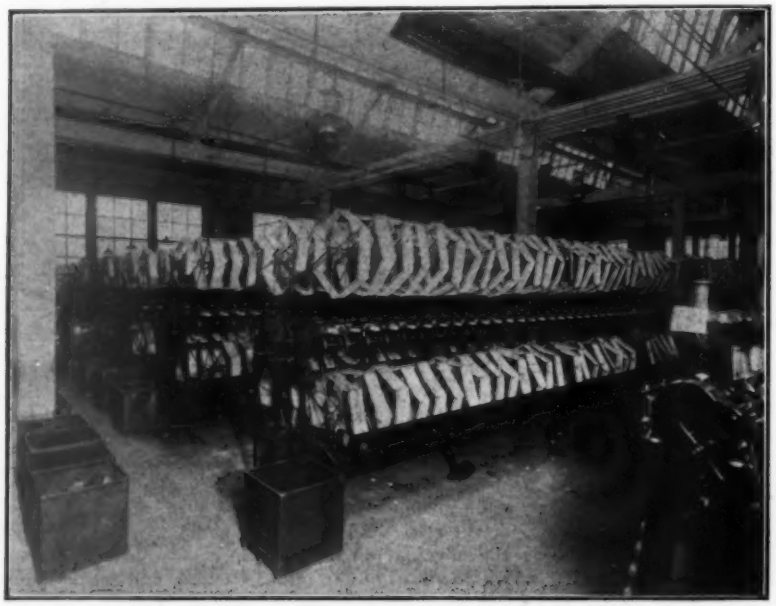


Group of Quilling Machines Driven by 10-Horsepower Motor.

At the dye house, the skeins are boiled in soap and water to free them from any remaining gum and give the desired softness and luster. This takes from the silk 20 to 30 per cent of its original moisture. The silk is then placed in the dyeing vat, and the dyer may or may not, by the use of metallic substances in the dye, make the skein appear heavier and stronger than it otherwise would be. Following the dyeing comes the process of winding the silk on spools, requiring great care on account of the softness of the material. When dyed silk leaves the hands of the soft-silk winder it is ready for weaving.

There are three so-called foundation weaves: taffeta, serge and satin. The formation of the warp is an important piece of work. The winding of the filling is accomplished by winding from a spool or bobbin to a smaller spool called a quill, in a quilling frame. The quill fits into the shuttle which conveys the thread across the warp. A good weaver operating a power loom will weave from 10 to 20 yards of goods in a 10-hour day.

From the looms the silk is sent to the printing machines which have a roller for each color. The processes in this department are exactly the same as in cotton print works. In case the silk has not been dyed in the skein it is sent from the looms directly to the dye house.



20-Horsepower Motor Driving Winding Frames in Silk Mill.

Motor Drive.

In considering the application of electric motors to silk mill machinery, no hard and fast rules can be followed, as each installation presents conditions that must be studied and met for each individual case. Comparatively little specific data on motor drive for this industry are available, the most comprehensive yet made public being a general discussion of silk-mill drives by Andrew Kidd, Jr., a consulting engineer of New York, who has given considerable study to this work, published by the General Electric Company.

While the cost of power is a small part of the total cost of finished silk, yet, competition keen, the enterprising manufacturer will grasp every oppor-

Group of Spinning Machines in Silk Mill Driven by Two 10-Horsepower Motors.

tunity to reduce the cost per yard of his manufactured article, and the electric motor has assisted him materially in this respect.

The three methods of driving are: (1) mechanically, by line shafting, belts or ropes; (2) electrically, by grouping looms or preparatory machines under one motor; and (3) electrically, by an individual motor for each machine, particularly looms.

The old system of long line shaft drive, running the full length of the weaving room, and countershafts driven from this main line shaft is a very inefficient means of transmitting power. One striking example of the extravagance of this system was recently called to the writer's attention. In an old mill an engine of 100-horsepower capacity was delivering power to looms and necessary preparatory machines, when the machines themselves stopped, and it was found that 42 horsepower was lost in transmission. This represents what is ordinarily termed "friction load," and is the power required to drive simply the shafting, belting and loose pulleys on the machines, when the machines themselves are idle. It is the friction load under this condition, but under this condition only, for as soon as the belts are shifted to the tight pulleys and the machines are placed in operation, this friction load is undoubtedly greatly increased. No method has as yet been devised to determine accurately the extent of this increase in the friction, but the fact remains and should never be lost sight of that the friction load under operating conditions is greater than when the machinery is idle; and it is the power necessary to overcome this increased friction load that must be paid for by the manufacturer, and for which he receives no return. This loss gradually becomes worse as the belts stretch, shafts and pulleys become more and more out of alinement and the bearings wear.

In this system the maintenance items, such as cost of attendance, care and renewals of belts, oil, etc., are to be seriously considered. Then there is the liability of an accident to the shafting causing the whole or a part of the mill to go out of commission, and thus materially reducing the total output of finished product for the day or the week, depending upon the amount of repairs necessary.

There is also the ever-present danger of dripping oil falling upon the raw material or the finished product.

In the motor-driven mill the first thing to be considered is whether the current is to be direct or alternating.

Under some conditions where the electric motor is used, a slight variation in speed is not objectionable; in fact, for machine tools, printing presses and railway service a decided variation in speed is required, and under this condition the direct-current motor is almost indispensable. However, inasmuch as the conditions in a silk mill demand constant speed, a little consideration will show that the alternating-current motor offers marked advantages.

If direct current is used, provision must be made to take care of the speed changes, which cannot be eliminated in the design of the motor. The reason for the variation in speed is that when the motor is started up, the field windings are cold and, consequently, their resistance is low, allowing an excess of current to flow through them. This excess of current tends to keep down the speed, and as the motor is being heated, say for three or four hours, the current slightly decreases, and the resistance and speed increase.

The speed of a 40-horsepower direct-current motor will vary seven per cent during the time the motor is heating up. A loom operating at 120 picks per minute would start off each morning at 111 picks per minute and gradually increase the number as the speed increased until the motor reached its

Group of Double-Deck Spinning Machines in Silk Mill.

normal temperature, when the looms would operate at 120 picks per minute for the balance of the day.

In order to compensate for these changes, a resistance box or rheostat must be inserted in the field circuit, and the strength of the field regulated frequently in such a manner as to keep the speed of the motor constant.

The speed of a direct-current motor will also vary if the voltage on the circuit changes, which change sometimes happens when a heavy load is thrown on or off the generator in the power house.

With alternating-current motors none of these difficulties are experienced. The speed of the motor does not vary when under constant load, but depends solely upon the speed of the engine which drives the generator. There are no brushes nor commutators, and no frictional parts, except the bearings; therefore, in comparing direct with alternating-current motors, the latter should decidedly be given the preference for silk mills.

The grouping of machines under one motor is looked upon favorably by many engineers and manufacturers, and very good results can be obtained from this system if particular attention is given to the arrangement of the shafting and the selection of the proper motor for the work to be performed. This system is used extensively where the machines being driven are run continuously, such as the preparatory machines used in a silk mill. The motor used should work up to its full capacity, in which case the highest economical efficiency is obtained.

A group of 48-inch looms, say 75 to 100 in number, can be driven by a 40 to 50-horsepower motor. As the torque required to start a loom is 100 per cent above normal running torque, this size motor would be ample for operating these machines successfully, since it is unlikely that a sufficient number of the looms would be started at the same moment to load the motor beyond its overload capacity.

As in the case of the mechanical drive, the group system drives the shafting and belting continuously, whether one or the total number of the machines are in operation. This group system has the advantage of greater flexibility than the mechanical system, due to the fact that any group may be run independently of another, and should a breakdown occur the particular group involved would be the only part of the mill affected.

The production of the looms is greatly increased, as the slipping of the belts is confined to one section, which gives a more constant speed. By reason of this more constant speed, the wear and breakage on the loom and the work of the loom "fixer" is greatly reduced. All heavy line shafting, hanger bearings and heavy belts are eliminated.

A direct-current motor is not to be recommended in silk mills for individual drive, as it is uneconomical and unsatisfactory for the conditions existing in silk-mill operation. Therefore, the following remarks apply to the alternating-current motor:

The method of installation is very simple, and is, in the majority of cases, entirely successful. In place of the belt pulleys used on mechanically-driven looms, and the friction clutch pulleys also used on such looms (and also advocated by some supporters of the individual electric drive), there is mounted a gear which meshes into the motor pinion. This gear is equipped with a special device, the duty of which is to protect the loom from excessive shock when the loom "bangs off," and which provides the same degree of elasticity as is obtained through the slipping of the belt and by the friction disk pulley ordinarily provided. A bracket bolted to the frame of the loom supports the motor. This bracket is so arranged that a vertical motion of the motor is allowed, as the different speeds of the loom are obtained by changing the motor pinion. The motor may also be supported from the jack shaft of the loom, in which case an eccentric bushing is provided which keeps the motor in perfect alinement and allows for the vertical movement necessary for changing the pinion. In all cases the motor is held to the loom in a very substantial and rigid manner.

It is generally preferable to stop the motor with the loom, thus saving all unnecessary losses and reducing the wear on the motor and its connections to the loom.

An oil switch is furnished with this equipment, and is held to the frame of the loom and connected to the shipper handle in such a manner that the weaver, to operate the loom, starts the motor instead of shifting the belt. The friction gear referred to in a preceding paragraph permits this to be done without damage to the machinery or to the fabric in the loom.

By any method of driving, either electrical or mechanical, that employs shafting and belting, certain losses appear at all times, due to friction and the slipping of belts, whether the looms are idle or in operation. These losses are eliminated entirely by the individual drive, as this arrangement requires energy only when actual production is being carried on.

The most beneficial result of the individual drive is the increased production. This is conservatively figured at 5 per cent, and is entirely due to the constant speed of the loom owing to the absence of all belts.

The maintenance item is reduced to a minimum, since there are no belts, line shafting or hanger bearings to be considered, the only frictional parts of the equipment being the motor bearings and gearing. The repairs on the loom are very much less for the group drive than for the mechanical system, and much less on the individual drive than on either. This installation is ideal, inasmuch as the looms may be placed to the best advantage for light, regardless of location to the generating plant. There is no dirt or oil overhead, and the pulleys and belts, which continually stir up dust through the atmosphere, are no longer required.

The first cost of installation for the individual drive is somewhat more than for the group drive, but when the increased production, decreased maintenance, unrestricted light, and the absence of all dirt and dust are taken into consideration, the manufacturer will agree that he will very soon be fully reimbursed for the extra expense incurred.

In the following two data sheets will be found detailed operating data relative to six typical silk mills purchasing power from central-station companies.

Signal Batteries Supplied by Central Station.

A new interlocking signal tower, with 60 operating levers, has been put in operation by the Boston & Albany Railroad about a half-mile east of the station at Worcester, Mass. All the signals are electrically lighted, being operated by storage batteries in duplicate, to which current is supplied by the Worcester Electric Light Company. One battery is under charge while the other is operating. The tower and equipment cost about $63,000. Six men, working in three shifts of two men each, are required to operate the tower, which controls the main line and all tracks entering the freight yard from the east.

Rates Reduced In Watertown.

The rates for electricity in Watertown, N. Y., as supplied by the Watertown Light & Power Company, were reduced on January 1. This company uses a graduated scale and the maximum rate has been reduced from 10 to 9 cents per kilowatt-hour, with the minimum rate still 4.3 cents.

Enlargement of Trolhattan Plant.

The board in charge of the Swedish Government's famous Trolhattan hydro-electric power plant has sought a government appropriation of $804,000 for enlargement of the plant and the installation of three or four additional generating units.

Silk Manufacturing Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Plant manufacturing black taffeta silk exclusively, buying the silk in the form of skeins and weaving it into silk cloth for dress goods. There are 45 men and girls employed, working 60 hours per week. The weekly output of the plant is 4,000 to 5,000 yards.

Total connected horsepower, 20. Total number of motors installed, 4. Average kilowatt-hours per month, 2,050. Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
November	2,666	March	2,167	July	1,118
December	2,939	April	1,914	August	2,125
January	1,938	May	1,929	September	2,016
February	1,895	June	1,775	October	2,180

Load-factor, 18 per cent; operating-time load-factor, 38 per cent.

The approximate electrical energy consumption per 100 yards manufactured is 10.5 kilowatt-hours.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts. The motors are of the squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
3	5	1,700	Each belted to a six-foot shaft, two hangers, and 64 feet of countershafting, 10 hangers, driving 22 Crompton & Knowles 36-inch silk looms. Capacity per loom, 14 yards per day; driven pulley 14 inches by 2.5 inches.
1	5	1,700	Belted to a two-hanger shaft and 90 feet of shafting, 16 hangers, driving five Atherton Machine Company warping frames (432 spools), driven pulley 12 inches by 2.5 inches; three Benjamin Eastwood Company 40-spindle quilling machines, driven pulley 9 inches by 3 inches; two National Mill Supply Company winding frames (30 spools), 14-inch wheels; and eight Crompton & Knowles 36-inch silk looms; driven pulley 14 inches by 2.5 inches, 14 yards per day.

Silk plant located at Paterson, N. J., purchasing energy from the Public Service Electric Company. Plant operates 55 hours per week.

Total connected horsepower, 40. Total number of motors installed, 2. Average kilowatt-hours per month, 2,044. Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
April	3,264	August	1,745	December	1,342
May	2,988	September	1,415	January	2,094
June	3,054	October	1,393	February	1,759
July	2,321	November	1,294	March	1,856

Load-factor, 9.4 per cent; operating-time load-factor, 19.6 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is 220 volts, direct current.

No.	Horse-power.	Speed R. P. M.	Application.
1	20	1,200	Shunt-wound motor belted to line shafting driving 114 36-inch Benjamin Eastwood Company broad silk looms.
1	20	1,200	Shunt-wound motor belted to line shafting driving 26 Eastwood 36-inch broad silk looms; nine Eastwood double winders; and seven Eastwood warpers.

Silk mill, buying the silk in the form of skeins and weaving it into silk cloth for dress goods. Plant operates 60 hours per week.

Total connected horsepower, 40. Total number of motors installed, 4. Average kilowatt-hours per month, 1,574.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	1,883	May	1,757	September	1,076
February	1,578	June	1,970	October	1,211
March	2,111	July	1,324	November	1,330
April	1,875	August	1,380	December	1,390

Load-factor, 7 per cent; operating-time load-factor, 15.1 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,200	Belted to line and countershafting driving 45 Crompton & Knowles 36-inch silk looms. Capacity 14 yards per day.
1	5	1,200	Belted to a 10-foot line shaft, two hangers, and 50 feet of countershafting driving 20 Crompton & Knowles 36-inch silk looms. Capacity 14 yards per day.
1	20	900	Belted to line shafting driving five Benjamin Eastwood 40-spindle quilling machines, driven pulley 9 inches by 3 inches; nine National Mill Supply Company winding frames, 30 spools each, 14-inch wheels; seven Eastwood warping frames, 432 spools each; and three Crompton & Knowles 36-inch silk looms, capacity 14 yards per day.
1	5	1,200	Geared direct to freight elevator mechanism.

Silk Manufacturing Data—Sheet No. 2.

Silk mill, buying silk in skeins. There are 75 men and girls employed working 60 hours per week. The capacity of the mill is approximately 25,500 yards of silk per month.

Total connected horsepower, 50. Total number of motors installed, 6. Average kilowatt-hours per month, 3,220.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	3,292	May	1,801	September	4,480
February	3,279	June	1,855	October	5,510
March	3,355	July	4,480	November	4,865
April	1,639	August	5,510	December	2,122

Load-factor, 11.9 per cent; operating-time load-factor, 25 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,700	Belted to a 10-foot line shaft, three hangers, and 100 feet of countershafting, 18 hangers, driving 40 Crompton & Knowles 36-inch broad silk looms, driven pulley 14 inches by 2.5 inches. Capacity 14 yards per day.
1	5	1,700	Belted to an eight-foot line shaft, three hangers, and 45 feet of countershafting, seven hangers, driving 20 Benjamin Eastwood Company 36-inch broad silk looms; driven pulley 14 inches by 2.5 inches. Capacity 14 yards per day.
1	5	1,700	Belted to a two-hanger line shaft and 90 feet of countershafting, 16 hangers, driving three Benjamin Eastwood Company 40-spindle quilling machines, driven pulley 9 inches by 3 inches; five Atherton Machine Company warping frames, 432 spools each, driven pulley 12 inches by 2.5 inches; two National Mill Supply Company winding frames, 30 spools each, 14-inch wheels; and 10 Crompton & Knowles 36-inch broad silk looms, driven pulley 14 inches by 2.5 inches, capacity 14 yards per day.
1	20	1,200	Belted to line and countershafting driving 10 Benjamin Eastwood Company double winders; seven Benjamin Eastwood Company warping frames, 430 spindles each; six Benjamin Eastwood Company 40-spindle quilling machines, driven pulley 9 inches by 3 inches; and two Crompton & Knowles 36-inch looms.
1	5	1,700	Belted to line shafting driving machine-shop equipment consisting of one engine lathe; one turret lathe, two drill presses; one emery grinder; one shaper; and one grindstone.
1	5	1,200	Geared direct to mechanism of freight elevator serving two floors.

Small silk mill on the lines of the Public Service Electric Company of New Jersey, manufacturing silk cloth for dress goods. The running hours per week are 60.

Total connected horsepower, 15. Total number of motors installed, 3. Average kilowatt-hours per month, 689.

Kilowatt-hours per month for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	853	May	751	September	473
February	1.502	June	729	October	457
March	965	July	523	November	321
April	710	August	517	December	472

Load-factor, 8.4 per cent; operating-time load-factor, 18 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
2	5	1,200	Each belted to a line shaft driving 15 Benjamin Eastwood Company 36-inch broad silk looms. Capacity 14 yards per 10-hour day.
1	5	1,200	Belted to line and countershafting driving three warping frames, 400 spindles each; two 40-spindle quilling machines; and two 30-spool winding frames.

Silk mill, operating 10 hours per day.

Total connected horsepower, 45. Total number of motors installed, 3. Average kilowatt-hours per month, 2,824.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	2,711	May	2,761	September	2,716
February	2,974	June	2,424	October	3,165
March	2,814	July	2,630	November	3,081
April	3,227	August	2,669	December	2,715

Load-factor, 11.5 per cent; operating-time load-factor, 24.1 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	20	900	Belted to line shafting driving 26 Eastwood 36-inch broad silk looms, capacity 14 yards per 10-hour day; nine double winders; and seven 432-spool warping frames.
1	20	900	Belted to line shafting driving 110 Eastwood 36-inch broad silk looms, capacity 14 yards per day.
1	5	1,200	Driving freight elevator.

Commercial Practice
Management, Rates, New Business

COMPENSATION LAWS AND ELECTRIC POWER.

By G. D. Crain, Jr.

One of the most significant developments of the time is the almost universal recognition of the need for a change in the century-old method of disposing of the claims of those injured in industrial accidents. The common law is giving place to a law based on the belief that society at large, and not the individual, should bear the burden of these accidents.

The development of this sentiment has resulted in the enactment of compensation laws in 24 states, and in preparations being made looking to legislation along this line in many more. It is a conservative prediction that within another ten years practically every state in the Union will have such a law. The reason the prediction can be safely made is because manufacturers themselves are proposing these measures in many instances, anticipating both public sentiment and active agitation by workingmen. Their motive is one of policy as well as principle, since having a fixed schedule of compensation, which can be figured on in advance, is obviously better than a system which insures litigation of a most disagreeable kind, with relatively little relief for the victim of the accident, no matter what the outcome of the case.

The important point in this connection, from the standpoint of the operator of a central station, is the effect of the new conditions on the demand for his service. The enactment of compensation laws, as suggested, means that every accident in which a man is hurt must be met by a corresponding payment. Few exceptions are made—drunkenness and willful or malicious infliction of injury being among these—and the only thing to be determined is the question of fact. The extent of the injury and the length of time during which the victim was disabled are all that need to be determined. The amount of the award is fixed in advance by law.

The common-law defenses of fellow service, contributory negligence and voluntary assumption of risk are wiped off the slate, and the successful interposition of these defenses in probably a majority of accident cases under the common-law system is rendered impossible.

This situation is a definite encouragement of accident prevention. The careless manufacturer who, under the common law, decided that he could easily evade payment of damages, is brought face to face with the necessity of making his plant as safe as possible, because he knows that any and all accidents must be compensated for, without regard to the question of whether they were the fault of the operative. A premium is put on care.

In the same way, the insurance companies, which heretofore have charged a flat rate for liability insurance, fixing a rate based on the experience of all the companies in each class, have found that it is necessary to increase the charge for insurance when a definite schedule of payments required to be made is fixed. In view of this increased burden, and the necessity, as well as the desirability, of distributing it more equitably among the members of each class of industries, the companies have begun to substitute for the flat class rate an individual rate, based on an analytical study of each risk, from the standpoint of the hazard.

The plan, in general, is that used in fire-insurance rating. A standard risk is taken, and charges are made for defects, compared with the standard, and credits given for improvements, each plant thus being made to stand on its own bottom, and to be rated on its merits. The manufacturer who refused to spend money for safety devices, because their installation would not reduce the cost of his insurance, finds under the new system that there is a financial inducement for him to do so.

The application of all of this to the business of the central stations is simply this: The use of electrical power and especially of individual motors means the elimination of one of the most serious hazards involved in the operation of manufacturing establishments. With every inducement put forward to the manufacturer to get rid of the chances for accident, the probability of his taking up the use of electricity for power purposes is obviously greatly increased.

The transmission equipment of a manufacturing plant, where steam power is used, constitutes a serious menace. Even with belts guarded as carefully as possible and every reasonable precaution taken to reduce the hazard, there are certain great dangers which must continue to exist. The shifting of belts, the danger of cast-iron pulleys breaking, the decreased amount of natural light available on account of the belts and shafting being overhead—all of these features, and more, operate to make the use of an involved and complicated system of transmission, which is necessary under any scheme of mechanical power, dangerous. The danger may be reduced, and may be greater in some places than others; but it is there, all the time.

The use of electricity, enabling the manufacturer to drive his machines with individual motors, at once cuts down the accident hazard to a great extent. As far as the hazard involved in the transmission is concerned, it is almost eliminated. Even if the group system is used, and one motor serves a number of machines, the amount of overhead belting and shafting involved is so small, compared with the general lineshaft system of operation, that a tremendous improvement in working conditions is immediately brought about.

Many consumers of power have been considering the installation of electrical equipment and the use of electric drive in their plants. In innumerable cases the chief argument against the change is the investment already made in steam plant and transmission equipment. Even taking this into consideration, the manufacturer hesitates, and continues in the old way largely from force of inertia. But with the big desideratum here indicated presented to him—securing a greater education in accident hazard, which will be reflected in a reduced liability insurance rate and in a smaller number of accidents in his plant—an impulse will be given that will often lead to a decision to throw out the old transmission system and put in electrical equipment throughout the plant.

For a long time the accident-reduction feature has been used by manufacturers of electrical equipment as an incidental argument. Few central-sta-

tion men have made use of it to any considerable extent. Comparisons of the cost of operation of the old plant and of electrical installations have been relied on to win the day, inasmuch as the dollars-and-cents feature of the situation has been the one stressed by the individual consumer. But the reduction of accident hazard can now be made one of the big features of selling talk both by the machinery men and the central stations, because, as explained, this has become not merely a more or less intangible advantage, but a definite proposition, the financial benefits of which can be measured.

The conditions which have been outlined, as existing in states where compensation laws have been put into effect, may be used by electrical interests in sections where such laws have not yet been adopted. It may be pointed out that such legislation is surely coming, and that it is far better to anticipate it than to wait until such changes are almost forced upon the manufacturer by the adoption of laws providing for specific compensation for injuries.

And in states where the insurance companies have not yet adopted the analytical system of rating, even though compensation laws have gone into effect, it may be stated by central-station men with confidence that the merit system is coming, and is a permanent condition that individual manufacturers must prepare to aline themselves with.

Taken all in all, the advent of compensation laws forms the best possible basis for predicting a great increase in the number of electrical installations in manufacturing plants.

New Business at Minneapolis.

The city council of Minneapolis has authorized execution of the street-lighting contract for 1914 with the Minneapolis General Electric Company, covering 2,800 arc lights and 900 "white-way" ornamental standards. This is an increase of 400 arc lights.

Among the power contracts closed by the company during the week, December 14-19, was one for 150 horsepower for the Gould Elevator Company. Another contract was for 55 horsepower for the operation of elevators in the Northwestern National Bank Building, displacing steam triplex pumps. A 40-horsepower contract was also secured from a warehouse company and 33 horsepower in miscellaneous small power business.

Special Heating Rate in Pittsfield.

The Pittsfield Electric Company, Pittsfield, Mass., has put in effect a special flat rate of four cents per kilowatt-hour for current supplied to heating devices. The company has installed an electric garage and has a competent man in charge to care for electric vehicles.

Commercial Inspection Bureau of the Boston Edison Company.

In a recent issue of *Edison Life*, the house organ of the Edison Electric Illuminating Company of Boston, Mass., R. S. Carpenter contributes an interesting article on the duties and scope of the new division of commercial inspection, which has lately been established.

In applying the title Commercial Inspection, says Mr. Carpenter, it is not our endeavor, as it might appear, to enhance the importance of the work of our division by the use of a more important designation than that under which it is commonly known, viz: the "Complaint Department." The fact is that the former expresses more clearly the scope of its work, while the latter is not sufficiently inclusive.

The analysis of the work of the commercial inspection division for the past year will bring out the fact that a large part of the letters which were written and the interviews which were held were for the purpose of giving information or adjusting conditions which might result in the furnishing of more satisfactory service. This information is of the most varied character, ranging from questions on the most simple and rudimentary principles of the business, to a request for answers to engineering problems which require the services of experts of the profession. Such questions as "How long does a watt last?" and "Would a 100-horsepower lamp light my bathroom?" are followed in rapid sequence with requests for cost of operating a shoe factory or of heating by electricity Boston's new Customs House. The former requires but the exercise of a little patience and kindness in dispensing common knowledge, but the latter are passed on to men who have spent their lives in the pursuit of such special problems.

The adjusting of conditions goes hand in hand with this information, one very frequently and logically leading to the other.

Our system of billing, embracing as it does the annual adjusting of accounts, causes to be corrected any gross misapplication of conditions; but it remains for the division under discussion to detect and foretell that such a rate, for example, or such a combination of load may work to the customer's disadvantage.

It is not to be intimated that care is not given to these essentials when a customer is taken upon our lines; but, as is known, conditions of any business are constantly changing, resulting in increases or reductions in the current consumption or load. Thus, although the rate originally applied may have been the best at the time, it might not best fit changed conditions of a later date. That such changes are being made continually is proved conclusively by the fact that the major part of the money refunded to the company's customers each month is for this reason.

In this respect the policy of the company is most liberal. We grant to the customer not only that which has been paid in excess of the maximum price of our commodity, but give the customer the benefit of a difference in his favor for the period of a few months prior to the change to a rate adapted to his particular conditions.

We go further than these mere bookkeeping problems, and if unable to help in the ways above mentioned, send a representative who visits the customer's premises and suggests such changes in installation, e. g., dividing of load to advantage, or combining of meters, as will tend to reduce consumption or increase efficiency. This class of work is of great value to our customers, and the demand for such assistance from us has materially grown.

We would not lead one to believe that we do not have complaints, and that they are not of primal importance in our business. Not only do we face the same questions and problems as above cited with our complaints, but we frequently have also to overcome prejudice possibly inherent and applying to all public-service corporations, and possibly acquired from a real or fancied injustice. Although this prejudice is common it can in a measure be reasoned away. Of greater weight than reasoning, however, is the practice of fairness and liberality which is the Boston Edison Company's policy, and following which none can justly retain such an opinion.

It is one of the essentials of success in this work to be able to consider the situation from both points of view, and while preserving the dignity of the company and conserving its interests, to be able to appreciate that the other man is a thinking, reasoning mortal and may be right. With this point of view we are at once on the proper basis for equitable settlement of any difficulty that would ordinarily arise.

We should in justice state, however, that the majority of our customers come to us with a fair-minded and reasonable proposition of what they believe is an error on our part. In most cases they are right and if not entirely so it is because they are not well informed as to our system. Needless to say, our energies are bent in making correction or in supplying the missing facts, and the satisfaction of dealing with these people is its own reward.

Reading Company Secures Ice-Making Load.

After investigating for a number of months and visiting the most modern ice plants in the country, among which were the Webster-Citizens Ice Company of Buffalo, N. Y., and the Knickerbocker Ice Company, of Chicago, Ill., the Reading Merchants Ice Company, of Reading, Pa., has decided to install electrically-driven machinery.

The York Manufacturing Company, of York, Pa., will furnish two vertical single acting 100-ton compressors. These will run at 68 revolutions per minute. The compressors are each capable of making 150 tons of ice if speeded up. The York Manufacturing Company is also furnishing a twelve-effect distill. This machine is capable of furnishing 65,000 gallons of pure water every 24 hours. The mixture used in this apparatus is one pound of steam to eight pounds of water. From the distill the water is run through cooling pipes and enters the freezing cans at 42 degrees Fahrenheit.

The We-Fu-Go & Scale Water Purifying Company will install its apparatus to soften and purify the condensing water in order that it will be in good shape to go to the distill. This machine has a capacity of 3,000 gallons per hour.

The ice making process is as follows: The ammonia gas is received in the compressor at 15 pounds back pressure. The gas is then compressed and goes to the condenser at 165 pounds head pressure. The warm gas then goes through the condenser and the condensing water at 54 degrees Fahrenheit liquifies it. The liquid ammonia then goes to an accumulator, from whence it is delivered to the expansion pipes. The expansion pipes are in a tank filled with brine. When the liquid ammonia expands in these pipes it draws heat from the brine. The brine is kept at a temperature generally of 10 degrees Fahrenheit. The cans filled with distilled water are immersed in the brine and frozen. The gas which has expanded to about 15 pounds pressure is drawn back to the compressor and starts over on its refrigerating cycle again.

The ice company has entered into a contract with the Metropolitan Electric Company for all electrical energy necessary for the operation of the plant. The electrical installation consists of: one 300-horsepower motor driving the ammonia compressor; four 2-horsepower vertical motors on the brine agitators; and one 20-horsepower motor driving the air compressor, water for the plant being taken from a well. A. L. Hart, of the power department, secured the contract for the Metropolitan Electric Company.

Advertising That Brings Power Business.

In its efforts to increase power business the Union Electric Light & Power Company, of St. Louis, Mo., has inaugurated a commendable advertising campaign which is meeting with much success. The accompanying illustration is a reproduction of a typical newspaper advertisement used in this connection. The feature of each ad is an illustration of the plant of some large customer with a statement of the customer's opinion of central-station service appended. In this case a large woodworking establishment, the H. Pauk & Sons Manufacturing Company, is used with a statement of Mr. Pauk reading, "As a result of installing motors on our woodworking machines we have increased our plant output, and for the same cost of operation we very much prefer purchased energy to that of our own generation. It has cost us less to operate with central-station service than with a steam plant which we used for years."

ALSO—
This Plant Is Operated by "Union Electric" Service
¶ Plant of H. PAUK & SONS MANUFACTURING CO., 1308-1327 N. Fifteenth St.
¶ Mr. Pauk replaced the steam plant with UNION ELECTRIC service in August, 1910, since which time he has operated by Central Station service exclusively, using over 170 horse-power in motors.
¶ Our manufacturing customers are greatly pleased with our service and do not hesitate to say so. In speaking of our Central Station service Mr. Pauk says:
"As a result of installing motors on our woodworking machines we have increased our plant output, and for the same cost of operation we very much prefer purchased energy to that of our own generation. It has cost us less to operate with Central Station service than with a steam plant which we used for years."
¶ Such expressions of satisfaction as the above are very gratifying.
¶ Our power engineers will gladly investigate your plant and submit a report without obligation on your part.
Phones
Main 3225
Central 3530
UNION
ELECTRIC
LIGHT & POWER
SERVICE

Typical Advertisement of the Union Electric Light & Power Company Used in Power Campaign.

Reduction in Rates at Morristown, Pa.

H. H. Ganser, manager of the Counties Gas and Electric Company, Morristown, Pa., furnishes the following data relative to the reduction in electricity rates recently effected.

Sliding scale rate for kilowatt-hours:

First	100	per month	@	10c.
Next	100	per month	@	7c.
Next	100	per month	@	6c.
Next	100	per month	@	5c.
Next	400	per month	@	4c.
Next	500	per month	@	3c.
Over	1300	per month	@	2c.

Minimum charge; No bill submitted on this schedule less than $2.00. If the connected load of a consumer is more than two horsepower the minimum charge shall be $1.00 per horsepower for all connected load.

Discount: Bills to be rendered at one cent per kilowatt-hour above the foregoing rates and subject to a discount of one per cent per kilowatt-hour if paid at the office of the company within ten days after presentation.

When the current consumption for any month computed at the aforesaid rates exceeds $75, the consumer shall be entitled to a further discount of 10 per cent thereon, provided the amount of such further discount shall not reduce the amount due for such consumption to an amount less than $75.00.

Supplementary discounts: No. 1. Where the company supplies the consumer with electric energy at the primary voltage of its distribution line, and the consumer furnishes the necessary transformers, a further discount of 5 per cent will be allowed from the monthly bill, figured at the aforesaid rate.

No. 2. If the power-factor on the entire load, due to lagging current, is maintained at 95 per cent or better, a further discount of 5 per cent will be allowed on bills figured at the aforesaid rate.

Commonwealth Edison Company Makes Big Increase in 1913.

Statistics have recently been made public showing that during the year 1913 the Commonwealth Edison Company, Chicago, increased its total connected load by the equivalent of about 2,400,000 50-watt units. Of this increase nearly 61,000 horsepower is due to increase in the railway load. The number of customers increased 31,098, or 17 per cent.

Remarkable gains were also made in commercial lighting and power, the output of energy for this service increasing 22 per cent over 1912. The total connected load of the company is now equivalent to more than 13,000,000 50-watt units. The total rating of generating stations is about 350,000 kilowatts.

Life Insurance for Utility Employees.

The United Railroads of San Francisco, which operates most of the street railways in that city, has adopted a policy of taking out life-insurance policies for its employees, and about $1,250,000 in policies were distributed to the men at the first of the year. Every man who has been in the company's employ for three years is insured for $250; for four years, $500; for five years or more, $1,000. Policies were issued to 1,587 men.

Electric Sign Data

Selling Electric Signs.

Electric signs are about the easiest commodity on the market to sell, providing the salesman is equipped with definite data of a character that will interest the prospect. The market for electric signs is almost without limit and the demand is ever increasing. In spite of this, however, the complaint is heard on many sides, particularly from central stations, that the lack of definite information with which it is possible to equip the central-station salesman in his fight for this class of business has been the cause of somewhat retarding sign development. One utility manager writes, "If an insurance man attempted to sell life insurance to a prospect and was not backed up with any more good, solid concrete facts and arguments than the central-station solicitor is backed up with in his efforts to obtain such business, I am of the opinion that the charitable institutions would be gorged and overflowing with widows left without a sustenance."

It is with the hope of relieving, to some extent, these conditions that we inaugurate this sign section, in which will be published, each week, a sketch or photograph of some original or noteworthy sign that may be used by central-station or sign salesmen in interesting prospects in a similar line. Data will be given regarding the equipment of the sign, color and flashing effects and approximate cost. Attention is called to the standard size of the data sheet, which can be cut from the page and made the basis of a "sign data book."

In order to make this section entirely representative, we earnestly solicit the co-operation of sign manufacturers and salesmen. Central stations are also invited to send accounts of sign campaigns and to advise as to their methods of securing customers, etc.

The first suggestion offered is that of a Greenwood sign manufactured for the Chero-Cola Company of Columbus, Ga. The sign is very effective and is giving entire satisfaction to the purchasers. National and local advertisers dealing in beverages should be interested in this suggestion.

In connection with soliciting sign business too much emphasis cannot be placed upon the item of cost. The sign data book of the Commercial Section, N. E. L. A., states that "overloading the customer" is bad practice, whether in merchandise or advertising. It should be the salesman's policy to sell his customer a sign that fits both his business and pocket-book.

In estimating the costs and value of electric advertising three things must be considered—the size and first cost of the sign; the cost of current and maintenance; and the cost or value of the location. Against these items should be set down as credits, the advertising value of the sign and its efficiency as a sales influence.

It is obviously impossible to give any useful approximations of cost. The salesman should endeavor to persuade his customer to make an investment in proportion to the importance of the business—neither extravagant and wasteful, nor small and undignified. Especially should the customer be warned against trying to crowd over-much reading matter into the sign by using too small letters.

"Cut your cost to fit the cloth" is a mighty good motto to remember in this connection.

Also, the sign salesman should carefully study the location before recommending a sign. Such a study includes careful analysis of the number and class of passers-by, the distance from which the sign could be read, etc.

Electric sign being built for the Chero-Cola Company by the Greenwood Advertising Company, Knoxville, Tenn.

Dimensions of the sign are 40 feet high by 40 feet wide. 900 five-watt lamps are used.

Flasher effect comprises a bottle emptying into the glass which fills up and froths over in a realistic manner. Following this the words "Chero-Cola" and outline of tail light up on one switch; then the big figure "5" and cent mark and lastly. "There's None so Good" in red letters.

The color scheme is brought out in the bottle and glass with amber and red Betts & Betts color caps with opal caps of the same make used on the foam.

The approximate cost of the sign is $2,000 erected, complete.

Electrical Construction

A METHOD OF CONDUIT CONSTRUCTION.

A Short Discussion of a Mode of Conduit Installation of Recent Success which Has Been Used On a Number of Street-Lighting Schemes.

By H. E. Weightman.

The writer had the pleasure of seeing the completion last year of two of a number of underground conduit jobs that are of general interest on account of the method of laying pursued.

The first job was of bituminized-fiber duct, of which about 27,600 feet was laid, with 38 manholes and 226 handholes. The conduit line was to supply 226 street lights of a series tungsten system.

A discussion of the lighting system will be in order as it will give the reader an idea of the layout of the work. The lamps were mounted on a twelve-foot ornamental iron pole with a sixteen-inch globe inclosing the lamp. The posts were set on concrete bases 2.5 feet square and 4.0 feet deep and securely anchored by means of four ⅞-inch bolts. Into this base was built a pipe bend of the same material as the conduit. At each lamp was built a handhole in the duct lines and branch duct or laterals were run from the handhole to the bend built in the lamp base. In each block were built two manholes. These manholes were of concrete, oval in plan, 6.0 feet long, 3.5 feet wide, and 4.0 feet deep, with cast-iron covers. The illustration shows the manhole, which was standard for both jobs.

The second job consisted of vitrified-clay duct, about 31,940 feet being laid. There were 232 electric light poles and handholes, with 55 manholes.

The duct, excepting under driveways, was laid on undisturbed earth, in true alinement, with closed joints, and over the joints was placed a three-inch-wide burlap, over which was troweled a reinforcement of cement mortar, two inches thick in the case of the vitrified-tile duct. In placing the bituminized-fiber duct no cement mortar was used, the lengths being joined only by the sleeves furnished by the manufacturer of the duct. The conduit of either type was reinforced by a four-inch bed of concrete on all sides where the duct ran across the streets or under driveways. All conduit was of three inches internal diameter and was laid 20 inches below the surface and back of the curb line.

The above method was used from motives of economy and has been used quite successfully in late years. Whether to use a concrete encasement or not seems to be chiefly a question of interest on the investment in the encasement versus the cost of repairing the conduit and inclosed cable where they are damaged by the predatory street paver, and each case must be decided on its own merits. In the cases mentioned, the conduit was placed back of the curb line so that there was very little likelihood of its being disturbed.

Whether to use bituminized-fiber or vitrified-clay conduit for this kind of work will depend upon more than duct cost and life. The conditions of soil it is to be laid in, such as drainage and the presence of foreign currents from power conductors, are some of the factors governing the case. Just how some of these affect the problem will be considered later.

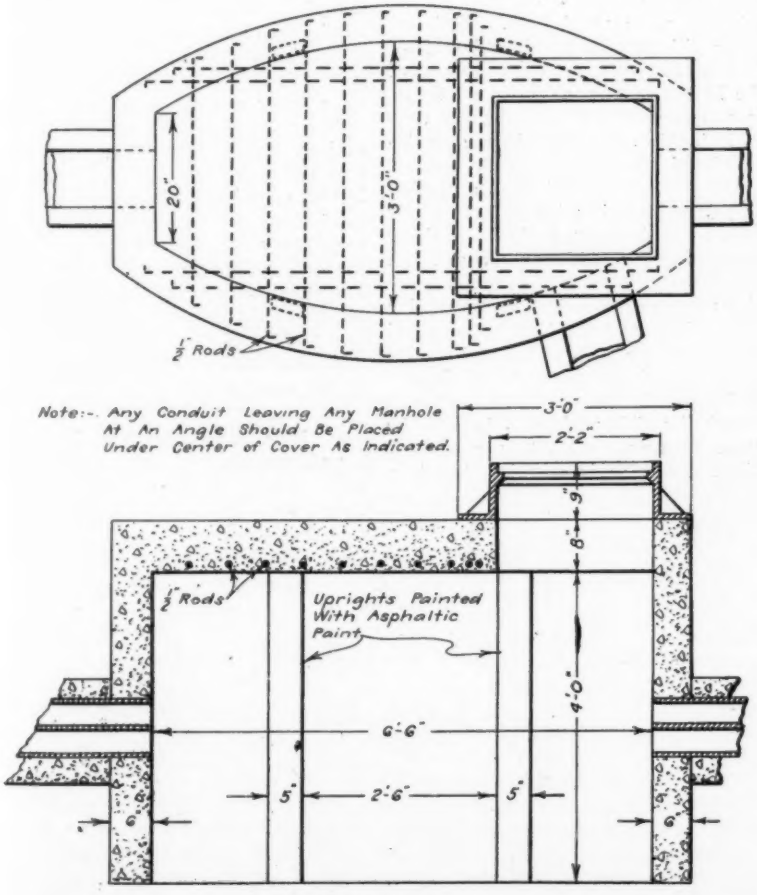
Among the advantages which bituminized fiber has over the vitrified-clay duct are: It is light, reducing freight and handling costs. More of this duct can be laid in a day's work, with less skilled laborers, than can be done with clay. It is possible to make it in longer lengths, which means fewer joints. The body is more waterproof than clay.

Some things that must be considered before omitting the concrete encasement on conduit systems are as follows:

(1) Mechanical injury.

(2) Chemical decomposition of the cable sheath.

(3) Electrolysis.



Details of Manhole.

Considering the first of the above factors, mechanical injury—with the conduit placed in the street it would be extremely liable to be damaged by excavators for plumbing, etc., and the conduit would be fortunate indeed if it were not completely knocked out of alinement when an attempt was made to roll the street previous to paving. Where the ground is very moist there is a greater tendency to settle and such conditions must be carefully considered. It would be hardly safe, if possible, to omit the concrete encasement on a line of more than one or two ducts. On the writer's jobs, as the conduit was placed back of the curb and in a firm, well drained sandy soil, it was advisable on the score of economy to omit the encasement.

I have separated chemical decomposition from electrolysis in my discussion because there are cases where chemical action, with no assistance from foreign electrical currents, has caused considerable damage to lead-covered cable. The usual question is, what is the cause of such deterioration? Poor drainage is the chief cause of such damage and with a water-holding soil adjacent to the conduit the action is much intensified. If the water were pure it would have no action on the lead sheath by itself, but in the presence of free oxygen in the air the lead is quickly attacked, with a formation of a hydrated oxide which is appreciably soluble in water and forms an alkaline liquid. When carbonic acid or nitrate of ammonia is present the action is intensified. In ducts which are not properly drained this is particularly noticeable. The water of course percolates from the surface of the street and in traversing the ground picks up the sulphur and nitrogen componds that are in the coal gas with which the earth is permeated. As a rule it, also, gathers some chlorine; then while working into the duct, through the ordinary poor cement joint, of which the newer method of conduit laying is a splendid example, it gathers up carbonates from the cement. The water also takes up in the street a certain amount of tannin from the leaves, grasses, twigs, etc., besides uric acid and other animal matter. Therefore, when the water finally reaches the inside of the duct, it is extremely well saturated with elements capable of attacking the lead sheath with great vigor.

To eliminate these effects, then, we must do three things:

(*a*) Build the conduit so that no water will ever lie in it, i. e., with a slope from the middle of the duct both ways toward the manholes.

(*b*) Try and make absolutely watertight joints.

(*c*) So plan the drainage that water will not stand around the conduit.

On the second job of our discussion the soil was sandy and well drained toward the lake so that the sand was always comparatively dry. The soil was so free from vegetable and other waterholding matter that it was necessary for the gardener to haul black earth to the job to plant his trees in. On the first job the soil was more moist and as better drainage could not be expected, bituminized-fiber duct was used. As mentioned before, the latter style of duct cuts the number of joints down remarkably and as the sleeves make a good tight joint and the duct is more waterproof than clay, it was easily the best to use. There was also more danger of soil settlement which again indicated the use of bituminized-fiber conduit.

Consider now how electrolysis would affect the problem. As stated before, the conduit is more liable to contain water of a destructive chemical nature where the concrete encasement is not used and the presence of increased quantities of acidulated or alkaline water will do a great deal toward furthering electrolytic action. There are a considerable number of good theories in regard to electrolysis, but the one I am about to write, seems to fit the present case nicely and is simple. White lead, used largely in the manufacture of paint, is made as follows. Hydrated oxide of lead, mixed with carbonate of lead in the proportion of 25 per cent of the former to 75 per cent of the latter, is cast into little disks not more than ⅛ inch thick. These disks are put into glazed earthen pots with a small quantity of acetic acid, then a number of pots are put in a bin and the whole covered with spent tanbark or other fermenting vegetable matter and left for three months. The temperature rises; complex chemical decomposition takes place, and the lead is converted into what we call white lead to the amount of about 65 per cent of the materials put in the pot. The residue is remelted and is again put through the same process until all is converted. Now, our cable in question, lies in a glazed-tile duct corresponding to the pot at the white-lead manufacturer's. Our chemicals are furnished as stated before under the chemical decomposition of lead sheaths. You will see that we now have all we need to start the making of white lead on a small scale. Now when stray currents from some power circuit traverse our cable we have a slight element of heat; slight, it is true, but, continued for any length of time, will do considerable damage.

In the jobs mentioned in this article the probability of damage from this source was slight enough to allow the concrete encasement to be left off without the expectation of great danger from this source. Then, too, the cost of replacing the cable will not be as great as the interest on the investment for the encasement.

As given above, there are numerous disadvantages to building conduit lines without the concrete encasement and the only possible advantage probably lies in first cost and interest on the investment, versus increased maintenance costs. Each case must be settled on its own merits. What would be economically possible in one case might not do at all in another, even in the same locality. This happens to be the case near the bituminized-fiber job mentioned above.

Another job in the same vicinity is nearing completion in which vitrified-tile duct is being used. On this job there will be approximately 45,700 feet of tile duct, 76 manholes, 367 handholes and electric light posts. On this job the drainage is considerably better and the profile such that it assists the sewers in draining the area.

Standard Metal Finishes.

At the last annual convention of the National Electrical Contractors' Association, held at Chattanooga, Tenn., a committee was appointed on Standard Metal Finishes, of which Paul H. Jaehnig is chairman. The committee arranged sample cabinets containing specimens of the various styles of finish which they thought might be made standard. Each of these is designated by a letter and number. Thirty-four different samples are contained in this cabinet, which opens on a hinge and is dust tight. Final adoption of this collection of finishes as standard will depend upon the action of members of the Association in declaring their preference for the scheme. The committee has sent out circulars explaining the matter to the members of the Association and the proposal has met with enenthusiastic response from a great many of the members.

Fire Protection Meeting.

The Chicago Chapter of the National Fire Protection Association held a meeting on the evening of January 12 in the auditorium of the Chicago Board of Underwriters. The speaker of the evening was R. D. Kohn, of New York City, who is president of the National Fire Protection Association. Short addresses were made also by Mr. Miller, superintendent of buildings in New York City, who is president of the New York Chapter, and by F. J. Stewart, superintendent of the New York Board of Underwriters.

The Chicago Chapter was organized at a meeting held on December 15, 1913, and it is planned to hold monthly meetings of the local members and to cooperate with all local civic bodies in an

endeavor to reduce excessive fire waste. The president of the Chicago Chapter is Frank D. Chase, and the secretary is William S. Boyd.

A Reel For BX Conductor.

Perhaps one of the worst articles to handle around a contractor's shop is a loose coil of BX conductor. In order to keep it in good condition and have the coil in neat shape we made a reel which is illustrated in the accompanying figure. First a cross-piece is made by building up seven-eighth-inch pieces to double thickness, as shown in Fig. 1. This acts as a carrier and upon it is mounted a wooden candy pail, which was readily obtained. This is toenailed to the cross-piece and a piece of

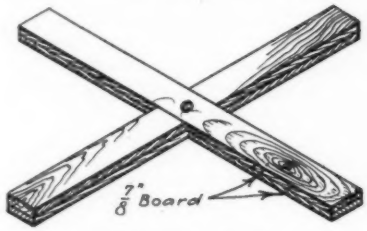


Fig. 1.—Cross-Piece.

conduit of any convenient size is run through for a spindle and is provided with large washers and locknuts at the ends to hold it in place. Below the carrier arms are mounted four ordinary furniture casters. These permit the reel to turn freely. The reel is mounted on any convenient box and the coil of BX is simply dropped over the candy pail. The coils are all of nearly the same size, so that they fit on the same

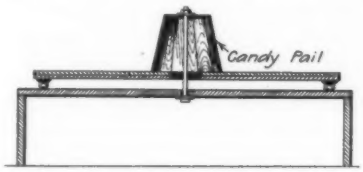


Fig. 2.—Complete Reel.

reel well enough. This arrangement saves much time in handling, as well as space.

E. M. Raetz.

Signaling in New York Police Department.

A scheme for signaling to policemen on their beats was installed last month in New York City, as a trial installation. On top of each street post bearing a telephone box there is mounted a green lamp. When the lieutenant at the station desk presses a button, lamps are lighted on five of these posts, which are, of course, on five different beats. The lights remain on until some one of the five men answers by telephone. This installation is being tried in the West Thirtieth Street Station District.

Among the Contractors.

The Electric Construction Company, of Salt Lake City, Utah, has taken over the business and stock of the Inland Electric Company and the Gunn Electric Company.

The W. H. Smith Electrical Engineering Company, of Portland, Ore., has secured the contract for the electrical work in the Pittock Building.

The contract for the electrical work on the new county buildings being erected by Cook County, Ill., at Oak Forest, has been awarded to W. F. Cummings, of Chicago.

H. A. Haynes, of Chester, Pa., has secured the contract for the electrical installation of the Texas Oil Company at its Delaware River terminal.

The Jamestown Electric Company, Jamestown, N. Y., has secured the contract for the electrical installation in a large printing establishment in that city.

Hoben and Marry have recently established an electrical contracting business at 124 East Simmons Street in Galesburg, Ill., where each has had an extended practical experience. The company is specializing particularly in the installation of farm lighting systems for which it has an agency in that locality.

Spence & Finn, Altoona, Pa., have the contract for the $10,000 residence being erected at Altoona by W. Frank Vaughn.

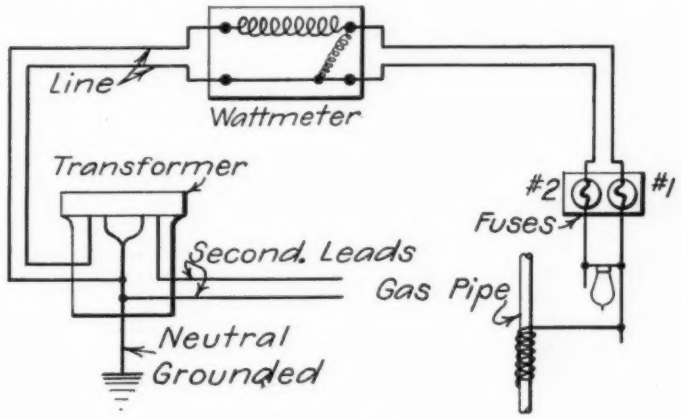
The Keele Electric Company has recently started a general electrical contracting and repair business at 706 Jackson Street, Topeka, Kans. B. Keele, who is manager of the company, has a wide acquaintance in Topeka, where he has had an extended practical experience in the electrical business.

The Machinists' Electric Company, of Topeka, Kans., is wiring the new state printing plant at Topeka, which is expected to be ready for occupancy by March 1.

The Tucker Electric Company, of Topeka, Kans., has just completed the installation of the "White Way" in North Topeka. The cost of the installation was $16,000.

Detecting a Theft of Current.

On lines where the transformers have the neutral grounded it is often sought by current thieves to transpose the line wires so that it is the neutral instead of the outside wire which is connected to the current coil of the meter. Beyond the meter this circuit goes through a fuse and beyond the fuse the neutral side is bonded to a gas pipe or other ground connection. The meter will



Wattmeter Connected in Grounded Line.

probably operate until the fuse on the grounded line is unscrewed, after which no more current will be registered. These connections are shown in the accompanying diagram.

The inspector can detect this condition by seeing whether the lights on the circuit go out when each fuse is unscrewed individually. If the lights continue burning after fuse No. 1 is unscrewed, it indicates that something is wrong. I have found, as inspector, a number of cases in which this scheme had been used to steal current.

E. V. Smith.

Flux for Aluminum Solder.

A flux for aluminum solder has been invented and patented by Hugo Hammar, of Delhi, N. Y. It consists of soft soap and beeswax, in the proportion of one part of the former to four parts of the latter.

The Electrical Contractors' Association of Wisconsin.

The eleventh annual meeting of the Electrical Contractors' Association of Wisconsin was held at the Hotel Wisconsin, January 12, 13 and 14. Monday morning, January 12, was devoted principally to registration and in the afternoon there was a business session. In the evening the Association went in a party to the Majestic Theater.

A business session was held on Tuesday morning when a discussion of the Lien Law was participated in.

On Tuesday afternoon there was an open session at which addresses were made as follows: Ernest Freeman, president of the National Electrical Contractors' Association, "The National Electrical Contractors' Association"; W. W. Low, "The Relation of the Jobber to the Contractor"; F. F. Skeel, "The Relation of the Manufacturer to the Contractor"; F. A. Vaughn, "The Relation of the Consulting Engineer to the Contractor"; A. C. Langstadt, "The Relation of the Contractor to His Business Relatives."

Mr. Freeman spoke at some length regarding the history and development of the National Electrical Contractors' Association. He recited the growth from its beginning in 1902 with 31 members to its present position in the field with 1,250 members representing every principal city in the country. Some of the work that Mr. Freeman spoke of particularly related to the activity of the Association with respect to establishing uniformity in the interpretation of the National Electrical Code, the preparaton of a set of symbols for electrical installation details which have become practically standard and universal, the preparation of charts establishing the proper conduit sizes for circuits of various dimensions, the standardization of screws and screw parts, fixtures and the finish of plates. The work of the legislative committee, especially with reference to a uniform license law, was referred to.

Mr. Low called attention to the low average charge usual with the contractors' orders upon the supply dealer. Looking into the business of one large supply house it is discovered that 66.6 per cent of the entire volume of the business is for orders of less than $10. The average is about $2.19. Something like 60 per cent of orders from contractors are handled at a loss. Notwithstanding this the sliding scale of prices which the jobbers have effected in practically all cases protects the contractor against the small user of electrical supplies who would prefer to buy from the jobber in order to get a little better price than could be given him by the local dealer. However, in spite of the protective feature of the sliding-scale arrangement a great many contractors have persistently tried to break down this arrangement and to Mr. Low's mind this was a very grave mistake. Incidentally the contractor invariably prefers to deal direct with the manufacturer when large orders for material are involved. This is anything but a recognition of the supply man's position with relation to the contractor, and ignores the fact that the supply man establishes a warehouse whereby the contractor can get material from fresh stocks at any time, order material in any emergency and have practically immediate deliveries.

Mr. Skeel made an eloquent plea for competition upward. It was his opinion that the contractor could be a very elemental force in bringing about a recognition of quality of materials for electrical installations. It has been observed that the contractors as a rule could not be depended upon to recognize superior qualities in materials of construction, and rather than run the chance of losing a contract they would make their bids for the work based upon the use of the cheapest material.

Mr. Vaughn's paper was presented by A. J. Sweet. A consulting engineer usually establishes a code of ethics which builds for him a reputation. It is a matter of pride with the consulting engineer to work toward quality and invariably he specifies goods which have passed tests for superiority. With the consulting engineer in charge of the specification all contractors are placed on a parity and there is no tendency to use poor material or to work against the best interests of the client through skimping the job. The contractor can co-operate with the consulting engineer by giving him the benefit of his experience and by making a conscientious effort to work with the engineer so that the client will get a good job. Mr. Vaughn is of the opinion that the architect should devote all of his energies to following the study of architecture and that the properly equipped architect is not in a position to be familiar with the many details and the rapid advances made with respect to engineering requirements. The consulting engineer is by training and constant study equipped to handle the engineering problems and a ready co-operation upon the part of the contractor will rapidly establish an improved position for contracting generally.

Mr. Langstadt spoke in a happy and optimistic mood respecting the possible relations, of the contractor with the electrical supply jobber and the manufacturer. It was his opinion that most of the difficulties that beset each of them was due to a lack of proper getting together. There was too much of a tendency of each trying to be first and ignoring the rights of the other. The ideal situation would be reached when the manufacturer upheld the jobber and the jobber upheld the manufacturer and the contractor upheld both. The jobber as a rule was disposed to be fair and the contractor could not expect to go to the jobber and get something for nothing. There must be reciprocation and harmonious effort upon the part of each.

The session was enlivened by a spirited discussion of the jobber-contractor situation. On the one hand it was held that the contractor was suffering grievously from labor troubles in one direction and through the pernicious efforts of certain jobbers who were sending their salesmen throughout the country and peddling electrical supplies of every description in small lots, giving the consumer as good a price as the contractor was getting. The idea was advanced that the contractor was in business as a permanent institution and that he created a special trade entity which should have the full recognition of the supply man and manufacturer, and that where the consumer was not in this class that he should be penalized because of the temporary character of his demand. On the other hand, the proposition was advanced with equal vigor that the jobber, through the arrangement of a sliding-scale of prices, was treating the contractor as a trade ally, and that there was ample compensation and opportunity for profit in the difference between the price made to the contractor as a trade entity and the price to occasional consumers.

At the close of the formal session A. A. Gray, of Chicago, delivered an address explaining the plans and policies of the Society for Electrical Development, Incorporated, on behalf of J. M. Wakeman, general manager, who was not able to be present. Mr. Gray stated that latest advices from the general office in New York indicated that there were 1,181 members subscribing to the Society, comprising 157 electrical manufacturers, 249 central stations, 245 jobbers, 514 electrical contractors and 16 miscellaneous affiliations.

In the evening the annual banquet of the Association was held at the Hotel Wisconsin, L. W. Burch, of Madison, Wis., acting as toastmaster.

At the business session on Wednesday morning officers were elected for the year as follows:

President, W. R. Johnson; vice-president, L. W. Burch; treasurer, George Knoerr; secretary, Albert Petermann.

The summer meeting will be held at Detroit at the same time as the meeting of the National Electrical Contractors' Association.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Reinforcing a Hickey.

To keep the thread of a hickey from breaking, force a piece of three-quarter-inch conduit about 12 inches long into the lower end of the hickey, keeping it flush with the threaded end, as shown in the figure. This will tend to keep the thread from breaking and will insure a solid hickey. I have used mine for two years and have never had any trouble with it yet. E. Gelbgesser.

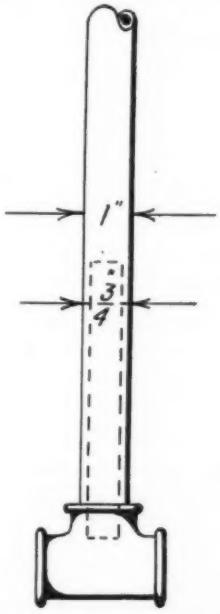


Fig. 1.—Reinforced Hickey.

Replacing Lamp Retainer of a Film Socket.

The following method was devised for changing the lamp retainer of film sockets on a series street lighting circuit without the necessity of carrying a ladder. For removing and replacthe lamps the men were using Matthews lamp changers on the ends of long poles. I suggested fastening an old lamp base on the other end of the pole. This can be screwed into the socket and the lamp holder then pulled out and replaced. This also does away with any possibility of danger from handling the lamp or socket when the current is on. J. G. Wetmore.

Tracing Connections.

I was recently called upon to number the meter loops to correspond with the numbers of the suites in an apartment house. The wiring had been completed but no meters had been installed. Not wanting to take the fixtures down and cut in at the wires, I used the following scheme. I took a piece of cord with an extension plug on one end and a battery connected to the other. I screwed the plug into the socket of a fixture and then went down to the meter closet and found the corresponding pair of wires by means of a bell. In this way I was able to quickly pick out the pair of wires coming from each flat. A. B. Whiteman.

Stripping Insulation.

Fig. 2 shows a little tool which I use for skinning lamp cord, fixture wire, etc. It is made from a strip of strap steel an inch wide. The edges at *A* and *B* are filed sharp enough to cut the insulation. It is then bent into the form shown. When the lamp cord is slipped between these jaws and given a slight twist the insulation will slip off readily without breaking any of the small strands of wire.

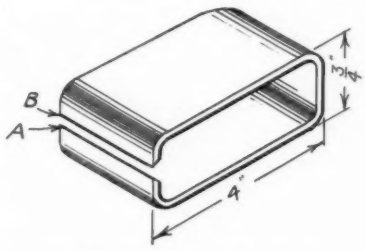


Fig. 2.—Tool for Skinning Cord.

F. H. M. Riley.

Drilling Marble or Slate.

A method for making it easy to drill marble or slate has already been given, but I have learned of a much better method which I used recently in a plant where a lot of switches and cutouts were to be installed upon iron columns, which necessitated considerable drilling of the slabs for mounting. By using a little ammonia as a wash, flushing the drill and hole with it while boring, the job becomes like cutting butter with a hot knife.

R. H. Eddy.

Operating a Bell on a Closed Circuit.

The ordinary stock type of vibrating bell cannot be operated from closed-circuit batteries such as are frequently found in alarm installations. It is common practice to install a relay and supplementary battery. This can be obviated by making a very slight change in the bell connections so that no extra relay and battery are necessary. The connections are shown in the accompanying figure. The battery is connected to the two usual terminals, but the contact of the vibrating tongue is connected to the proper binding post through a push button, which is arranged to be ordinarily closed. Upon operation of this push button, this circuit is opened and the bell will ring.

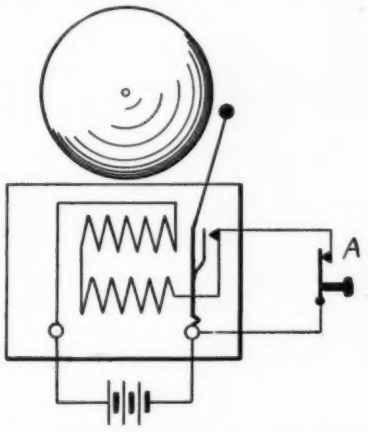


Fig. 3.—Operating Bell on Closed-Circuit Battery.

Ben R. Browne.

Getting the Conduit Plumb.

I recently had a job where I had to run quite a lot of piping on side walls to switches and the owner was very particular to have all the piping plumb. I cut a V-shaped notch in the end of a board about three inches wide, which was long enough to reach from the floor to the ceiling. In the notch I fastened a cord with a plumb bob. All I had to do then was to stand the board against the elbow at the ceiling in order to plumb the pipe, as shown in the accompanying figure.

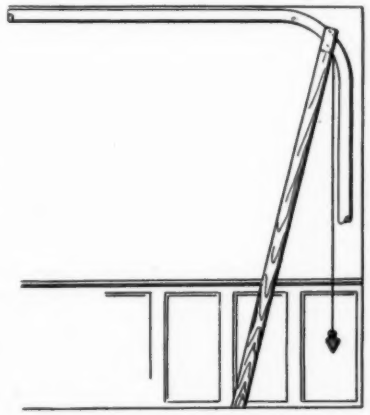


Fig. 4.—Plumbing Conduit.

E. Ammann.

Public Service Commissions

CALIFORNIA.

The Railroad Commission has rendered a decision denying the application of the Coast Counties Gas & Electric Company for authority to issue 2,000 shares of its six-per-cent preferred stock.

The Midland Counties Public Service Corporation was granted authority to issue $79,000 of bonds for the purpose of paying off indebtedness incurred in construction of new lines.

Authority was granted to the Tulare County Power Company to issue $80,000 in stock for enlargements to its steam plant and for the construction of new lines and distribution systems.

A decision was rendered granting authority to the Northern California Power Company, Consolidated, to issue $12,000 of promissory notes.

KANSAS.

The United States Supreme Court in a recent decision upheld the power of the Public Utilities Commission to revise existing rates regardless of a contract between a city and the utility company fixing the rates for gas, which exists in the company's franchise. This is in conformity with another recent decision upholding the power of the State Railroad Commission of Kentucky to control the rates of the Louisville & Nashville Railroad, regardless of the fact that the maximum freight rates were fixed in its original charter granted in 1850.

MASSACHUSETTS.

In his inaugural address January 7, Governor David I. Walsh made important recommendations to the Legislature of Massachusetts on matters affecting electric lighting and power companies. Chief among them was the recommendation that the supervision and regulation of water power and electric power companies be given at once to the Gas and Electric Light Commission. There is at present no regulation of these companies by a public service commission. Governor Walsh says they should be subjected to the same supervision as to capital and rates as railroad, telephone, telegraph, gas and electric light companies.

The Governor advises the doing away with a present obstruction to the municipal ownership of lighting utilities, by which no town or city in the state can now undertake either electric or gas lighting without purchasing both the gas and electric lighting plant privately owned, if there is such a company in the community. The law now is, that the private company can at its option compel the city to buy its property, or it may refuse to sell and continue in the business as a competitor of the municipality, but the law gives no option on this matter to the municipality itself. In other states either no restriction is imposed on the entrance of the municipality into the business, or it is only required to obtain from the state board supervising the industry a certificate of public convenience and necessity. It is recommended that the Gas and Electric Light Commission be given authority to exempt municipalities from the compulsion to purchase existing plants, after a public hearing and upon petition by the local authorities. The Governor further recommends that the supervision and regulation of telephone and telegraph companies be transferred from the Public Service Commission to the Gas and Electric Light Commission, and that all public utility companies regulated by public commissions should reimburse the state for the expense of such regulation. This rule now applies to gas and electric light companies, but the companies supervised by the Public Service Commission have been exempt, though formerly railroad and railway companies reimbursed the state for the costs of the Railroad Commission.

The full bench of the Supreme Court of Massachusetts has annulled the order by which the Public Service Commission last August authorized the New York, New Haven & Hartford Railroad Company to issue convertible bonds to the amount of $67,552,000.

The Public Service Commission has approved the giving of free transportation to district nurses by the Connecticut Valley Street Railway Association, with the understanding that this action shall not be construed as establishing a precedent for similar action in the future.

The Gas and Electric Light Commissioners of Massachusetts have submitted recommendations to the Legislature looking to a clearer defining of their powers in cases of stock issues. During the past year the Supreme Court of the state has issued an important decision, in which the Commission's authority in the case of the Fall River Gas Company's request for the approval of an issue of securities, which was dismissed by the Commission, was overruled and the right to issue approved. The court's action calls in question the fundamental principles of state regulation of stock issues. The laws have aimed at limiting the issue of securities by public service corporations to their actual needs and to prohibit the representation in additional securities of surplus earnings invested in plant. The theory has been that the volume of securities outstanding has a strong effect on rates and quality of service, The Commission says that the court's decision was couched in such language as to be made the basis of a claim that the only function of the Board is to determine whether the amount of money to be raised is necessary for the particular work done or to be done. It is also asserted by some that all expenditures for new property must, if the company requests, be represented in new securities, regardless of the fact that no obligations may be then outstanding on account of such expenditures, or of the company's condition at the time the Board's approval is sought. The Board holds that these constructions are erroneous and that the Court did not intend to thus weaken existing law. The Board asks that future disputes be obviated by a definite legislative enactment.

The Gas and Electric Light Commission has approved the issue, by the Attleborough Steam and Electric Company, of 400 shares of new capital stock, at $150 per share, the proceeds to be applied to the payment of obligations incurred after June 30, 1913, in the enlargement of its generating station and equipment.

The Commission has authorized the Lawrence Gas Company to enter the town of Boxford for the supply of electricity for light, heat and power. Boxford has now no facilities for electric lighting.

MISSOURI.

The Supreme Court of the state has held that the Public Service Commission Act of 1913 repeals an ordinance of the city of St. Louis, passed in

February, 1911, for the purpose of regulating electric light companies. In 1907 the legislature authorized cities to appoint utility commissions and to regulate their own public utilities. An ordinance passed by the city of St. Louis required the Union Electric Light & Power Company to supply free meters and lamp renewals and to charge not more than 9.5 cents per kilowatt-hour for electric energy. The company carried the matter into court on the ground that this provision was confiscatory and that the act of the legislature upon which it was based had been repealed by the Public Service Commission Act. Both the lower court and the Supreme Court upheld the latter contention.

NEW JERSEY.

The Board of Public Utility Commissioners has submitted its annual report, covering the year 1913, to the governor. The Board sets forth that it has in this period approved of issues of stocks and securities to the total of $89,000,000, and has given approval to 84 ordinances and resolutions of municipal bodies granting privileges to public-utility companies. Suggestion is made for the prompt enactment of laws that will give the Board additional authority to control the issuance of utility corporation securities as follows:

(1) Specifically empowering the Commission to require proof when their approval to proposed security issues is asked, that there has been an adequate attempt on the part of the petitioner to ascertain and to obtain the highest price at which such securities may be sold; and in default of satisfactory proof, to impose as a condition of granting such approval, the advertising for sealed competitive bids for such securities, accompanied by certified checks guaranteeing the responsibility of the bidders.

(2) Amending the present law under which the Board's approval of the purpose of proposed security issues is made prerequisite to such approval, whereby such clause shall be defined by a prescribed rule indicating in general terms in what respect the purpose of the issue may be scrutinized by the Board with a view to approval or disapproval thereof.

(3) Making void all security issues by public utilities whether put out by way of sale or by way of pledge or hypothecation, and making such unauthorized issue a misdemeanor, unless the prior approval of the Board has been granted.

OHIO.

The Trumbull Public Service Company has been authorized by the Public Utilities Commission to issue its first-mortgage six-per-cent gold bonds to the face value of $148,000 to be sold for not less than 92 per cent of par. The proceeds are to be used for the reimbursement of income used for extensions and improvements.

The New Concord Water & Electric Company has been authorized to issue its 20-year, six-per-cent bonds to the amount of $17,000 to be sold for not less than 90 per cent of par. The proceeds are to be used for the payment of outstanding indebtedness incurred in construction, and for additional new construction.

The Lighting of Pictures.

The Artists Guild maintains in its rooms in the Fine Arts Building, Chicago, an exhibition of paintings and other objects of art and has recently experimented along the line of illuminating its exhibition rooms with a combination of mercury-vapor and tungsten lamps, with very satisfactory results.

The room in which this installation has been made is shown in the accompanying illustration, and has a floor area of 18 by 38 feet, with a ceiling height of 12 feet. The lamps are mounted above the large horizontal screen, which is seen in this picture, suspended three feet from the ceiling by chains. Hence nearly all of the light reaches the canvases indirectly, by reflection from the ceiling. The screen is 5 feet wide and 25 feet long. The lamps are divided into two groups and are mounted near the center line of the room, one group in each half of the room. Each group consists of a mercury-vapor lamp with a porcelain reflector mounted below, and four tungsten lamps surrounding it, provided with the No. 700 reflector manufactured by the National X-Ray Reflector Company. The tungsten lamps are each rated at 100 watts. The mercury-vapor lamps take 3.5 amperes and two are connected in series on a 110-volt circuit. Each lamp thus consumes about 190 watts, of which about one-third is dissipated in the series resistance which is necessary for regulation. These lamps when mounted in the usual way with a reflector above give a mean hemispherical candlepower of 300.

Exhibition Room A of the Artists Guild.

Artists have expressed great satisfaction with the effect obtained in this room and the way in which certain color tones of the pictures are brought out, especially those which appear dull when illuminated by incandescent lamps alone. Those in which blue and green tones predominate have their color values brought out more nearly in conformity with daylight effects. This installation was designed by George C. Keech, Chicago representative of the Cooper Hewitt Electric Company.

Harvard and Technology to Co-operate.

The Board of Overseers of Harvard University and the Corporation of the Massachusetts Institute of Technology have entered into a co-operation in educational work which has in view solely the best interests of those who are seeking the education. The two great institutions have before co-operated in the School for Health Officers, in its initial year already eminently successful, and in a far more important way they have agreed to join forces in a much broader field of scientific training, in which the prospects for success are even greater. It is neither more nor less than a co-operation in the conduct of the four courses leading to degrees in mechanical, electrical, civil and sanitary engineering, and mining engineering and metallurgy, and in the promotion of research in those branches of applied science. This agreement is bound to mark an era in the history of American education.

The movement is so novel and its consequences so far-reaching that a misunderstanding of the splendid character of the undertaking is possible, and yet, as is so often the case with great schemes the plan adopted is essentially simple. This plan is set forth in the agreement that has been entered into between the two institutions. The first principle and foundation stone of the whole matter is that the University and the Institute are to remain absolutely unaffected in name, organization, title to and rights over property or in any other way not specifically mentioned in the agreement. Each is to retain complete control of its own financial resources. Each is to be free to lay down such regulations as it likes with regard to the courses leading to its own degrees.

The co-operation is definitely lim-

ited to the great fields of engineering, all of which involve great expense in the maintenance of extensive and costly laboratories. In the interests of efficiency and convenience, for the concentration of effort and the elimination of waste and lost motion, it is agreed that all the work of education and research in these important branches of applied science shall be carried on within the buildings of the Institute, to be erected on its new site in Cambridge, bordering on Massachusetts Avenue and the Charles River Embankment. These buildings are being erected, arranged and equipped with a full knowledge of the best already existing in the world and with means and intention to surpass all others in fitness for their purpose.

For the maintenance and equipment of these laboratories and the payment of salaries, the University agrees to set aside practically all the money that it would otherwise be free to devote to education of this type. Technology, on its part, agrees to devote to the same general purpose all the funds or the income of funds that it now holds for carrying on work in the departments of engineering that have been named, and both institutions agree that their respective measures of support may be increased from time to time if disposable funds are available.

The faculty of Technology shall be enlarged by the addition to it of the associate professors of the four departments in the Harvard Schools of Applied Science, who, retaining their titles and privileges in Harvard University, will acquire the corresponding titles and privileges in the Institute. Similarly, the officers of corresponding rank in the four departments in the Institute will acquire the same titles and privileges in the University. The work of instruction and the laying down of courses leading to degrees is entrusted to the enlarged faculty of the Institute. Outside the departments of engineering that have been made, the faculty of the Institute will be appointed as at present—solely by the Corporation of the Institute. However, within the departments of mechanical, electrical, civil and mining engineering, both corporations will be concerned with the appointments of the instructing staff, but neither corporation will be called upon to make any payment of salary to a professor whose appointment has not been formally approved by it. The enlarged faculty will lay out courses of instruction for the students of both institutions.

The agreement is now complete, since it has been formally adopted and approved by the properly constituted authorities in both institutions.

THE ELECTROLYTIC DEPOSITION OF METALS.

Joint Meeting of Engineering Societies in New York City.

The 290th meeting of the American Institute of Electrical Engineers was held in the Engineering Societies Building, New York City, on the evening of January 9, as a joint meeting with the New York Sections of the American Electrochemical Society and the American Society of Mechanical Engineers. President C. O. Mailloux called the meeting to order at 8:25 p. m. The first paper to be presented was by Lawrence Addicks, of the American Electrochemical Society, and was entitled "The Power Problem in the Electrolytic Deposition of Metals."

The Power Problem in the Electrolytic Deposition of Metals.

The whole question is narrowed down to a copper-refining plant as typical of this general class of electrolytic processes. Here the following power limitations are imposed by present practice: (*a*) direct current; (*b*) say 8,000 to 15,000 amperes; (*c*) say 100 to 200 volts per circuit; (*d*) resulting in 800 to 3,000 kilowatt units—1,000 to 1,500 in present installations; (*e*) circuits electrically independent, to avoid cross leakage; (*f*) constant current; somewhat variable voltage—say ± 20 per cent; (*g*) steady current load night and day; (*h*) steam needed for heating electrolyte; (*i*) plants of from 3,000 to 9,000 kilowatts should be considered.

Amperage.—This is fixed by the current density and the electrode surface per tank. The current density is fixed by a balance between the interest on copper tied up, the cost of power and the difficulties in practical handling of rough deposits. Fig. 1 shows the approximate relation between cost of power and current density in American practice; the high densities, of course, call for cheap water power. Twenty amperes per square foot of active cathode surface may be taken as representing practice in the vicinity of New York, with an ampere efficiency of 90 per cent and an average consumption of about 1 kilowatt-hour at the switchboard per 6 pounds of copper. Electrode surface per tank has been steadily increased until 30 pairs of electrodes, three feet square, are used in one case. This calls for a current of $30 \times 3 \times 3 \times 2 \times 20 = 10{,}800$ amperes.

Voltage.—As we have to deal with a highly conducting electrolyte, containing 10 to 13 per cent of free sulphuric acid, which must be continually circulated to avoid stratification in the tanks, carefully studied construction is necessary to avoid serious trouble from leakage currents. These not only represent wasted energy, as shown by the so-called current efficiency, but wherever current jumps from the electrolyte to a lead pipe or other metallic conductor, a rigidly equivalent quantity of copper is deposited thereon and when traversing acid-soaked wood of relatively high resistance, a quantity of heat sufficient to cause a fire risk may be generated. It must be remembered that nearly the entire electrical energy produced at the generators appears as heat in the tanks. It can be readily appreciated that high voltages greatly aggravate these difficulties. While I have suggested 100 to 200 volts as the range per circuit, I favor the lower limit and do not believe voltages higher than 150 to be good practice.

Circuits.—The statements already made regarding current leakage indicate the undesirability of any electrical connection between generators, and I believe it would be necessary to use motor-generators instead of rotary converters in any scheme for distributing power from a large unit over several circuits.

Uniformity.—The first principle to be observed in the operation of an electrolytic refinery is uniformity of conditions. The process is very delicate and, while simple in theory, economy depends upon the successful balancing of many conditions to obtain the best results. In consequence, the current should be held at a fixed value, following variation in the resistance of a circuit with the voltage. Hand control of the field of shunt-wound generators is adequate, as the changes in resistance are very gradual. An exception to this statement is the case of cutting out sections of tanks for several hours when drawing copper. It is also necessary to carry up to 2 per cent insoluble-anode tanks, to correct the gradual accumulation of copper in the electrolyte, and as these require about six times the normal voltage for operation, they cause an appreciable variation in the total resistance of the tank house when they are added or withdrawn. To cover this range a field control of our typical generator from 120 to 180 volts at 10,000 amperes will be required.

Load-factor.—The operating conditions as described amount to practically 100-per-cent load-factor for both momentary and 24-hour loads.

Warming Electrolyte. — Electrolytes have a high positive temperature co-efficient of conductivity. As this amounts to about 0.5 per cent per degree Fahrenheit, and as the electrolyte represents about half the resistance of the circuit, it is evident that its temperature must be considered. In general, the electric energy dissipated in the tanks will maintain a temperature of 90 to 100 degrees and it has been found economical to add sufficient steam in closed-coil heating tanks to keep the circulating electrolyte at an average temperature of about 130 degrees. Exhaust steam can be used, and roughly an amount equivalent to one-fourth of the steam supplied to the engines is required. Additional steam is required for light and power, compressed air, pumping and the manifold requirements of a refining process of which electrolysis is but one step, so that figuring for the moment on the use of live steam for heating the electrolyte, only about one-half the total boiler capacity is used for electrolytic power generation. On the other hand, waste-heat boilers attached to the reverberatory furnaces which form a necessary part of every refinery will generate more than enough steam for heating the electrolyte and any other uses where steam, as such, is essential.

Size of Plants.—American copper refineries vary from 4,000,000 to 35,000,000 pounds monthly capacity. At 6 pounds per kilowatt-hour a 1,500-kilowatt generator would take care of 6,500,000 pounds per month. Eliminating the smaller plants and allowing for some future extension of the larger ones, we should consider from 2 to 6 circuits of 1,500 kilowatts each, equivalent to from

13,000,000 to 39,000,000 pounds of copper per month. Turning to present practice in the vicinity of New York, we find a very cheap source of fuel in No. 3 anthracite buckwheat at $1.75 per long ton delivered. Using this fuel, steam can be produced for about 15 cents per 1,000 pounds, including all operating expenses, but excluding administration, taxes, depreciation and interest charges. With this base price for steam, a kilowatt-hour can be safely figured at 0.4 cent on a similar basis, allowing for auxiliaries and a reasonable departure from ideal conditions in everyday operating. In fact 0.3 cent can be approached with first-class conditions. Present practice is to use moderate superheating and vacuum, with the highest grade of reciprocating engines. At the Raritan Copper Works four-cylinder Nordberg triple-expansion engines have recently been installed, while at the Chrome plant of the United States Metals Refining Company a triple-expansion unit using a compound Hamilton-Corliss engine with a Rateau turbine for the third expansion is being tried out. Previous in-

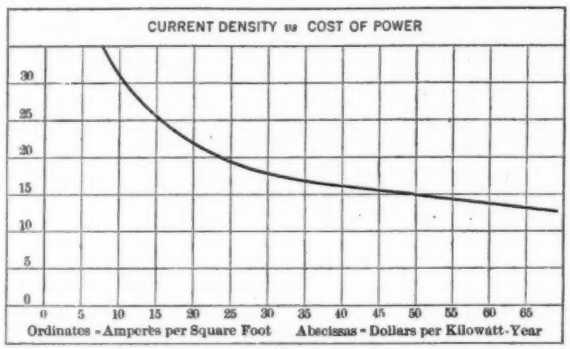


Fig. 1.—Relation Between Cost of Power and Current Density.

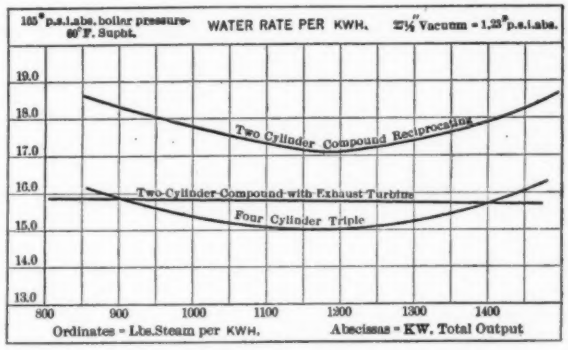


Fig. 2.—Water Rate per Kilowatt-Hour.

stallations have been chiefly confined to compound condensing units. Final figures for these recent installations are not yet available, but Fig. 2 shows about what can be expected from a 1,200-kilowatt unit of each type, excluding steam for operating condenser. The Chrome installation is of particular interest on account of the successful commutation of 6,000 amperes (the engine generator and turbogenerator running in parallel) at 1,500 revolutions per minute by a Rateau-Smoot generator. The installation cost of such power plants may be roughly taken at $100 a kilowatt.

The plant of the future may consist of gas-driven units of large capacity, alternating-current turbogenerators driving motor-generators of smaller size, of compound reciprocating engines exhausting into a trunk main from which exhaust-steam turbines are fed, of multiple-expansion reciprocating engines, of turbine-driven unipolar generators, or of some combination of these. Spare units must be provided in sufficient proportion to give absolute reliability of service.

The next paper was by H. E. Longwell, of the American Society of Mechanical Engineers, and dealt with the mechanical side of the problem. An abstract of this paper follows.

The Power Problem.

Mr. Longwell treated the power problem in a very general way, pointing out the necessity for not only good design in detail but a common-sense comprehensive view of the entire problem. He pointed out that fixed charges on the investment are quite as important as operating costs and frequently outweigh such considerations as economy in steam consumption. He compared a high-grade steam-turbine plant with a gas engine and producer plant, the units having a capacity of 1,500 kilowatts in each case. Assuming a high grade of fuel costing $3.00 per ton, the saving with the gas engine would amount to $6.00 per kilowatt per year; whereas, the increased first cost would be about $50 per kilowatt. Allowing six per cent for interest, one per cent for taxes, one per cent for insurance, two per cent for maintenance and eight per cent for amortization, he did not consider the extra outlay for the more efficient plant to be a good investment. Gas-engine eqipment should, therefore, not be considered for a plant to refine copper electrolytically, especially as such a plant would be located where there is abundant water supply for condensing purposes and where the cost of fuel is reasonable. Under such conditions a steam plant displays its best ecenomy. Another reason for choosing a steam plant is that waste-heat boilers can be used in connection with the reverberatory furnaces used in such a plant. He then considered the combination of compound reciprocating engines with low-pressure turbines and condensers. The reciprocating engine is usually more efficient than that portion of a turbine utilizing the same range of pressure, but this gain in fuel economy is more than counterbalanced by the additional first cost and costs for installation, attendance and maintenance. This combination is sometimes justified for the purpose of utilizing a reciprocating engine already installed, but not otherwise. He considered the turbine superior to the reciprocating engine as a prime mover, especially with modern condensing apparatus and a plentiful supply of cooling water. He realized, however, that steam turbines are less efficient than some multiple-expansion reciprocating engines. Formerly the turbine was at a disadvantage in generating direct current on account of its high rotative speed. This difficulty has been removed by the development of reliable transmission gear having an efficiency of over 98 per cent and allowing any reasonable speed ratio. Illustrations were given of a number of such geared generating sets. The turbine not only has an advantage in first cost over the reciprocating engine as a prime mover but its advantage is more marked when freight and installation costs are considered. For units from 6,000 to 9,000 kilowatts an average cost may be taken as $75 per kilowatt. Electric energy at 100-per-cent load-factor, such as exists in electrolytic copper plants, should cost at the switchboard about 4.3 mills per kilowatt-hour, where good coal can be obtained for $3.00 per ton and the investment charges are not over 10.5 per cent per annum.

The final paper of the evening was by F. D. Newbury, of the American Institute of Electrical Engineers, and was entitled "Sources of Direct Current for Electrochemical Processes."

Sources of Direct Current.

Mr. Newbury first outlined the problem involved in providing direct current for electrochemical processes. The usual conditions require a large current at comparatively low voltage. The problem involves the available prime movers and their advantageous operating speeds. He considered reciprocating steam engines, steam turbines and water wheels. He left gas and oil engines out of consideration. Commutation is the great problem with direct-current generators and converters handling heavy currents. The possibilities of supplying current at different speeds was discussed and a table given showing the outputs possible at different speeds with different numbers of poles. The distribution problem depends upon local conditions and where transmission for 1,000 feet or more is required, high voltage should be adopted for this purpose, with alternating-current generators and synchronous converters. Provision must be made for variation in voltage. Continuity of service is important and a design must be adopted which will insure this. Four types of steam-turbine-driven units were then considered: (*a*) direct-connected commutator-type direct-current generators; (*b*) direct-connected unipolar-type direct-current generators; (*c*) gear-connected commutator-type direct-current generators; (*d*) direct-connected alternating-current generator with synchronous converter. Class (*a*) is limited to relatively small current ratings on account of the high speed necessary. Machines of class (*b*) have been successfully constructed and have relatively high efficiency. The first cost and maintenance, however, are also high. This type is not favored. Class (*c*) is now a satisfactory type. Class (*d*) has been used in copper-refining plants and possesses obvious advantages. When the distances are great the generator can be wound for high voltage and step-down transformers installed at the converter.

It is also useful where different circuits must be electrically separated. The use of the induction-type generator was considered in this connection. A table is given showing the efficiencies for the various classes. Under water-wheel-driven units a plant having a capacity of 120,000 horsepower was considered and a comparison made between direct-current generation and alternating-current generation with converters. The efficiency of the latter is 10 per cent higher and the first cost only 81 per cent of the former. With the smaller plant this comparison would not be so favorable to it. A 60-cycle system is preferred to 25 cycles. Reciprocating engines have the advantage of lower speed and with them direct-connected direct-current generators should be used.

The discussion was opened by H. B. Coho, secretary of the New York Section of the American Electrochemical Society, who explained the absence of the president of that society, E. F. Roeber, as due to illness.

G. A. Roush pointed out that the size of plant discussed by Mr. Newbury was far larger than that generally used in electrochemical work and especially in copper refining. A comparison of cost on the basis of 120,000 horsepower would not apply to present individual plants, as such a capacity would probably be sufficient to serve all the electrochemical installations in the neighborhood of New York City.

F. A. Lidbury made a similar criticism of the paper by Mr. Newbury, as there is only one line of electrolytic industry, viz., the production of aluminum, which would require power upon such a scale. If this industry is excluded, most electrolytic plants will be found to have a power consumption from 1,000 to 10,000 horsepower, and single units of 5,000 kilowatts are not found, but the largest are more likely to be about 1,000 kilowatts. A comparison on this basis would have given results much different and would have been of more value to electrochemists. In most cases he considered it feasible to have water-wheel generators located close enough to the electrochemical plant to justify the generation of direct current. Coming to this basis of capacity, Mr. Newbury's table shows that direct-current generators of 1,000 kilowatts can be direct-connected to water wheels at speeds as high as 600 revolutions per minute for 250 volts, or at 300 revolutions per minute for 125 volts. As there are no speed difficulties, this puts a different aspect upon the comparative efficiency of direct-current and alternating-current generation. In addition to considerations of efficiency, first cost and reliability in operation, which enter into the above considerations by Mr. Newbury, it is necessary to give attention to other important considerations in making a choice of installation for the supply of power. One of these is maintenance and attendance costs, and the other is depreciation, which is low for copper conductors and high for rotary converters and the accompanying equipment. Moreover, the electrochemical engineer usually favors simplicity and is willing to pay extra for it. A good reason for this is a decrease in operating troubles. Reliability and smoothness of operation are not enhanced by multiplying the electrical links in the chain of power machinery.

F. L. Antisell, of the Raritan Copper Company, mentioned the importance of considering efficiency under partial load. The reciprocating engine maintains its efficiency better under low loads than does the turbine.

J. B. F. Herreschoff told of his experiences in an electrolytic copper refinery in New York City. In the early days when small units were used they were driven by triple-expansion engines operating at 350 revolutions per minute. These units were of about 400 kilowatts. Later direct-current turbogenerators running at 5,000 to 6,000 revolutions per minute were installed. The commutators of these, although very long, gave trouble. The machines generated also an enormous amount of heat, which indicated low efficiency, not over 70 per cent, although they were supposed to give 95 per cent. These were replaced with alternating-current turbogenerators running at high speed and low voltage and connected to a rotary converter.

J. B. Herreschoff, who is connected with the same plant, pointed out that by doubling the current the copper is deposited in half the time, but the voltage must be double, so that four times as much power is consumed. This has the advantage of keeping up the temperature of the electrolyte, as is done at Great Falls, Mont., where a current density of 40 amperes per square foot is used and the temperature of the electrolyte kept up to 150 degrees Fahrenheit. In the East, temperatures are usually from 130 to 135 degrees. In doubling the current density the cost of power per pound of copper is also doubled and the deposits are likely to be less smooth and more brittle. He referred to the control of voltage where rotary converters are used. With a single converter on one generator, voltage can be controlled through the generator field. With two rotaries on one alternator, differences of voltage can be obtained by weakening the field of one rotary and strengthening the field of the other. The effect of this upon the power-factor is to cause excessive heating in some of the parts.

C. O. Mailloux pointed out that while the kind of deposit depends upon the current density, good deposits can be obtained at high densities if conditions are properly controlled. He once used as high as 1,000 amperes per square foot, and a rate of 500 amperes is not uncommon where speed is an object, as in some forms of electrotyping. Ordinary electrotyping is done at a rate of 5 to 20 amperes per square foot, but good deposits can be obtained at higher rates by controlling the temperature, acidity and specific resistance of the electrolyte, and stirring it so as to bring fresh copper in contact with the cathode. Since there is almost no counter electromotive force in an electrolytic copper cell, the cost of power can be reduced to an almost negligible quantity by properly choosing the conditions, but such conditions do not represent the best for commercial operation. He considered that in many cases the most economical current density was higher than that actually used.

Lawrence Addicks pointed out that with high current density the circulation of the electrolyte must be increased. In silver and gold processes this cannot be done on account of the insoluble anode slime which is formed and which must be allowed to settle.

C. H. VomBaur pointed out the advantages of the oil engine, since crude oil is now available in New York City at less than three cents a gallon and a kilowatt-hour could be supplied for 0.45 cent, including all fixed charges and allowing 10 per cent for interest and depreciation. Engines of this type have been made in sizes as large as 2,000 horsepower per cylinder, which is large enough for such electrolytic work.

The authors of the papers then closed the discussion. Mr. Addicks considered the principal objection to gas and oil engines was unreliability. Mr. Longwell pointed out that his arguments applied only to the application of power under consideration and that other types of prime mover had their advantages under certain conditions of use. Mr. Newbury stated that the large size of water-wheel plant was considered with special reference to the aluminum industry and that for electrolytic plants near New York a steam unit was the only thing to be considered. With units of 1,000 or 2,000 kilowatts he agreed that a direct-connected direct-current generator was preferable to an alternator and rotary converter, if the plant can be located near the point of utilization. The efficiencies given in his paper were conservative and represented what would be actually obtained in practice. He pointed out that rotary converters give little trouble and should not be regarded as interfering with the simplicity of an installation. He agreed with Mr. Herreschoff regarding voltage control by a rotary converter. He pointed out that on account of the lowering of the power-factor it might result in excessive heating at the tap coils, unless the machine were especially designed for such use.

Mining Plants in Europe.

In France, as well as in other countries of Europe, the question of installing cable machines for use in mining plants is one which is receiving much attention on the part of electrical engineers. A typical installation, which is described below, is that at the Landres iron mines in France, which are operated by the Micheville Steel Company.

The regulations in force in France require all mining plants to have two distinct shafts to the surface. One of these shafts usually serves for taking out the material and for entry of air to the mine, and the second shaft is used for return of air to the surface and for secondary services such as circulation of men and material, etc. In the Landres mine it was desired to make use of this second shaft so as not only to take care of the secondary work but also to handle part of the material extracted from the mine, thus giving an additional output and at the same time affording a standby in case of accident to the principal shaft. Fig. 1 shows a view of the cable hoist which is now installed at shaft No. 2, it being driven by a direct-current electric motor. Besides the usual advantages afforded by the use of electric drive for the cable drum, local circumstances led to preferring this method over steam-engine drive, for it was intended to put in electric pumps of large output in the mine installation on account of the large amount of water to be pumped out, and a part of the pumping capacity was also needed in connection with water supply for a proposed increase in the electric station existing at the mines.

For the use of the mine water pumping it was required to install an alternating-current group on the three-phase system which should run without stopping, as the water pumping needed to be continuous. A machine of 1,500 kilowatts was needed for present and future service, and this power represents four times what the cable-drum motor will take. Owing to the proposed use of the alternator for pumping work, it became a matter of much less cost than usual to provide at the same time for the cable hoist, so that there was only the slight expense of choosing an alternator of somewhat larger size than what the pump work required, and the cost of the present outfit was practically limited to the cable plant proper. On the other hand there was quite an advantage in operating the cable drum on the present system from the fact that the alternator always works under a good load and thus there is less disturbance felt from the current variation occurring in the cable system.

The cable-drum outfit installed at the Landres mines is designed for the following conditions:

Standard lift; height.....760 feet
Net load, iron ore.....3 tons
Elevator (for one car), weight..3.7 tons
Weight of empty car.....0.9 ton
Steel cable, round, diameter.....1.5 inch
Steel cable, weight per foot....3.6 pounds
Number of trips per hour.....90
Total time of lift, actual.....30 seconds
Total time of lift, including maneuvers .....40 seconds

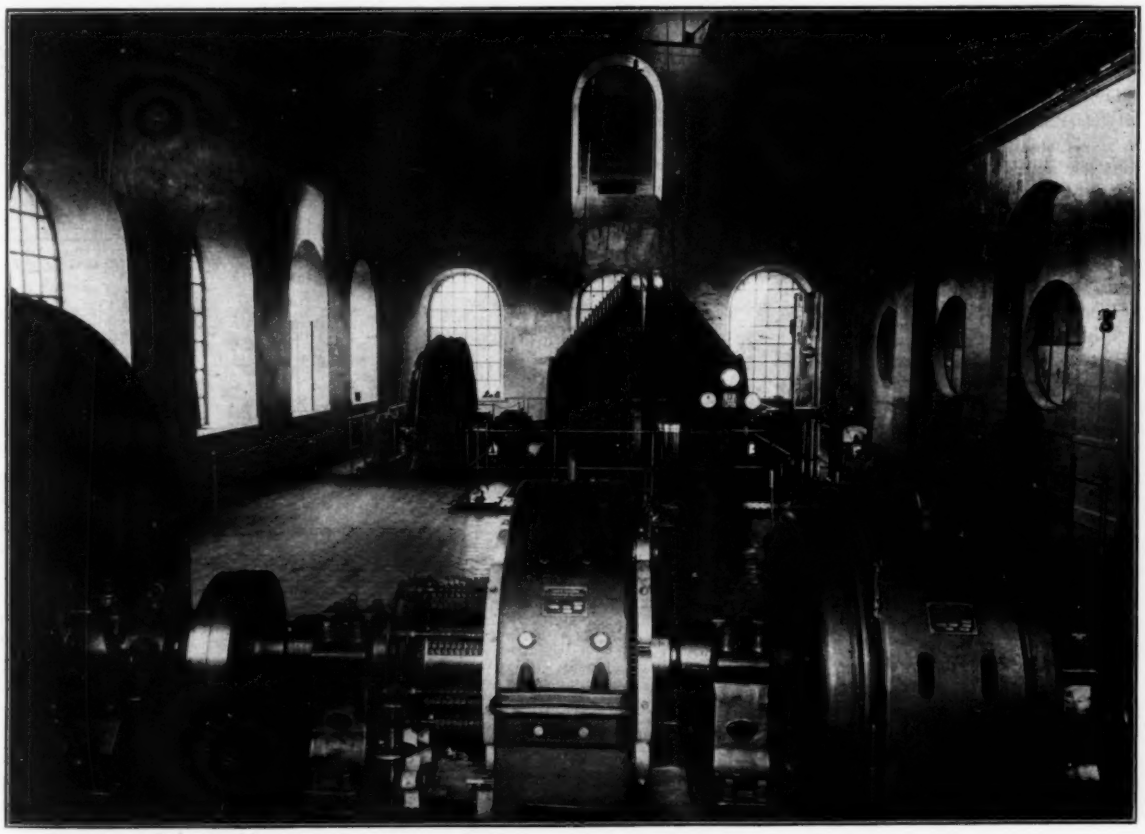


Fig. 1.—Hoisting Motor at Landres Iron Mines, with Motor-Generator Set in Foreground.

It was quite a difficult matter to carry out the program for working the lift, on account of the great number of trips per hour, and this could only be realized by a very easy-working machine and one which was capable of very exact control. For this reason it was not found advisable to use a three-phase motor, for the small depth of the mine and the frequency of starting made this solution an uneconomical one, and it was decided to use for the cable drum a direct-current

motor supplied by a motor-generator set consisting of a generator coupled to a three-phase motor, working on the Ward Leonard system, the whole of the present outfit being built at the Belfort works of the Société Alsacienne de Constructions Mécaniques. The cable-drum motor thus has independent and constant excitation of its field, and is supplied with variable current from the generator of the rotary set. Variation of the motor voltage serves to give the start, speed changes, braking and reverse drive as is usual upon this system, and the variable voltage is secured by varying the exciting current of the generator. Thus a simple field rheostat with reversing switch worked by a lever supplies for all the maneuvers of the cable hoist. As is well known, when slowing up or upon the descent of loads, the cable-drum motor works as a generator and restores energy to the system, and electric braking is obtained in this way to the best advantage. As the central station would run at a disadvantage under the frequent starts and stops of the cable system, the amount of power taken from the main alternator is made more uniform by the use of a flywheel of considerable weight mounted on the shaft of the motor-generator, and this flywheel acts to store up energy during the stop periods and to restore it during the working periods, and thus the rotary group with its flywheel serves as a buffer between the central station and the cable-drum system. The rotary set is seen in the foreground of Fig. 1.

It was not found advisable to use the Koepe type of drum, such as is in favor in mines on the Continent, for, although it is a very practical type in numerous cases, it is not suited to this mine on account of the small depth of the shaft. On the other hand, a cylindrical drum has the drawback of giving a variable load, on account of the difference in weight of the rolled and unrolled cables. For these reasons it was decided to employ drums of conical shape, as seen in Fig. 1, and they make it possible to keep the load due to the cables and accordingly the current in motor and generator practically constant and the present method gave the best solution of the problem under the above conditions. Such drums have end diameters of about 10 and 20 feet.

A few features of the cable machine and its brakes and other safety devices will be of interest. One of the drums can be made loose on the shaft for the adjustment of cables and it is stopped by a brake worked by a handwheel, this brake acting on a suitable rim. The two drums can be fastened in fixed position by a screw system which gives a very close final adjustment of the cables. Access to the inside of the drums is easy and allows of operations of attaching the cables, these being brought to the shaft for anchoring. The shaft is of Siemens-Martin steel and at the motor side it carries a forged flange for coupling on to the electric motor. Self-oiling bearings are employed.

The brakes consist of a double-jaw system working upon drums which are solid

Fig. 2.—Direct-Current Turbogenerators in Courrières Coal Mines.

with the cable drums, the jaws working upon lower joints, these latter being well mounted in the foundation. Brakes are operated by compressed air, and are thrown either by the cylinder of the working brake or by the safety-brake cylinder.

Fig. 3.—1,500-Horsepower Hoisting Motors at Courrières Mines.

The former is a horizontal cylinder with direct action and the latter is mounted vertically and uses a counterweight device. The brake works in the first place as a working brake to stop the machine by its own effect or to block the load which is already stopped. Such operation is carried out by a lever which acts on the three-way cock of the compressed-air supply, and the brake is thrown by the horizontal piston, this action being gradual and easily adjusted. Secondly, the brake acts as a safety brake, and for this purpose the brake is connected to a counterweight which is normally kept lifted by the presence of the compressed air on the piston of the vertical cylinder. When the counterweight falls it throws on the brake.

The safety-brake system is one which is carefully worked out, and it is thrown in the following cases: (1) When the compressed-air supply fails. (2) Should the lift rise above the level of the shaft mouth beyond a standard amount. In

this case the index of the mine-level indicator in the machine room operates to throw the brake by a rod-and-lever device. (3) The brake can be worked by hand by the use of a suitable lever in case the regular brake should fail to work.

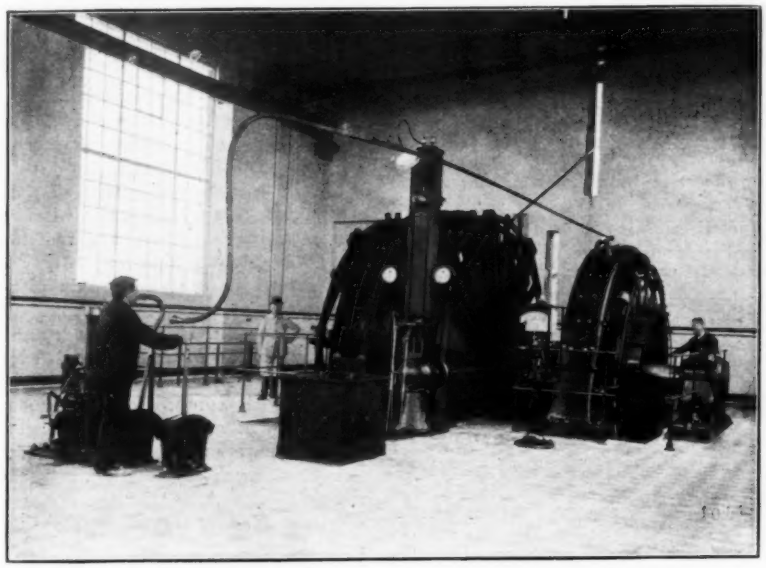


Fig. 4.—Hoisting Motor at St. Thérèse Potash Mines.

(4) It can also be thrown by an electric method by the use of a solenoid. The core of the solenoid is normally held up by the existing current taken from the 500-volt busbars of the central station. If this current is broken, the core falls

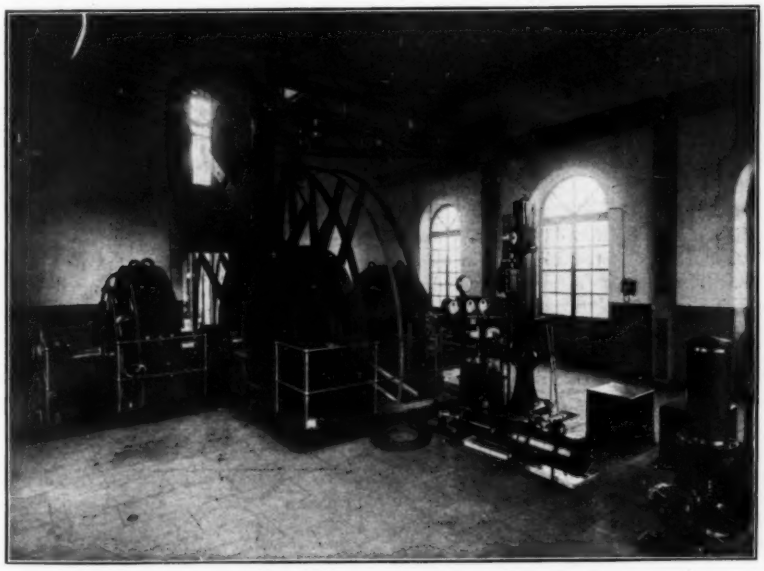


Fig. 5.—Hoisting Motors at Carmaux Coal Mines.

and by a suitable device it causes the counterweight of the safety brake to drop.

The electric braking method is a useful addition to the system, and it is used in the following cases: (1) When the current of the station 500-volt circuit fails, this current serving to feed the field circuits of generators and motors; (2) upon the working of the automatic circuit-breaker of the main motor circuit; to this end the circuit-breaker is provided with an extra break which opens the circuit of the above mentioned solenoid; (3) when the lift runs at too high speed in the shaft; the Karlick recording speed indicator is provided with an extra contact device which puts current on a relay so as to break the current of the solenoid, and this happens when the speed rises above a standard rate; (4) should the lift rise above the upper level, a switch placed above the shaft mouth and a second contact device mounted on the machine room level-indicator, serve to break the current in the solenoid.

The fall of the counterweight of the safety brake has also the effect of cutting off the field current of the generator by a suitable contact device, and in this way the cable motor no longer receives current when the brakes are thrown. The compressed air used for the system is supplied by a small motor-driven compressor with automatic action, the three-phase motor being provided with a ball-governor contact. When the air pressure falls below five atmospheres, an air relay closes the motor circuit and the motor starts, being again thrown off when seven atmospheres is reached.

Two separate hand-lever stands are mounted in the machine room, and one of these has the lever for working the above mentioned field rheostats. The second lever serves to operate the brakes. The mine-level indicator shows the position of the lifts within the shafts, being made up of two indicating pieces guided in mounting and descent by two endless screws, these latter being worked from the cable machine shaft by countershaft and gearing. Such indicator is fitted with a device which causes an automatic slow-up of the machine in case of inattention on the operator's part, and to carry this out the indicator corresponding to the rising elevator in the shaft is made to bear upon a pedal at the proper time. By means of a rod-and-lever device, this pedal acts on the working lever and brings it to a point near the stop position. Should the operator then have failed to carry out the full stop by this lever when the elevator comes to the shaft mouth, the indicator piece acts upon a second pedal which throws the safety brake.

Turning to the electric motor, this is mounted on the cable machine shaft between the main bearing and an outer bearing. By the use of coupling disks, the motor can be readily dismounted. The motor is supplied at a voltage varying from 0 to $\pm$ 500 volts, and its speed varies from zero to + 41 revolutions per minute, with power varying up to 1,000 horsepower. It has commutating poles which give sparkless working at all loads and speeds, and both directions of drive. Fields are excited from the station 500-volt busbars, the field current being constant during the whole of the working period. However, at the stops, an extra resistance mounted on the steering apparatus is automatically thrown into the circuit of the fields, and their loss is thus reduced considerably.

The rotary group comprises a three-phase motor, generator and flywheel. Commutating poles and compensating winding are used in the generator. The motor furnishes up to 450 horsepower at a speed of 485 revolutions per minute. A semi-elastic coupling connects the flywheel on the shaft, this being of cast steel in

one piece and weighing 15 tons. It has a peripheral speed of 300 feet per second. According to its design, when its speed falls from 485 to 410 revolutions per minute, the flywheel furnishes the extra energy which the main plant would otherwise need to supply from the moment when the power taken by the cable machine exceeds the mean power till the moment when it falls below that value. Conversely, the flywheel absorbs during the stopping periods the energy set free at the previous period, and its speed rises to 485 revolutions per minute. In this way the power used by the three-phase motor remains about constant. To obtain the speed variations which allow of using the energy of the flywheel, a rheostat is operated automatically in the circuit of the rotor of the three-phase motor, and the same rheostat serves for starting the motor. As the air friction losses in the flywheel are far from being negligible at the speeds employed here, the wheel is inclosed in a sheet-metal case. Flywheel bearings are fitted with water cooling, and a hand pump sends oil under pressure into the bearings before starting up. A hand-wheel brake is used for stopping the rotary group.

An interesting point about the Landres plant is the method by which the cable motor can be run directly upon current from one of the generators in the central station if need be. In case of accident to the motor-generator set or upon failure of three-phase current, the cable machine can be operated temporarily in the following way: The main plant contains two similar groups made up of a compound engine running at 110 revolutions per minute coupled to a direct-current generator with auxiliary poles, designed for 600 kilowatts at 500 volts. A special switch allows of sending the current from either of these generators into the cable motor. In order to run the motor on variable voltage, field current for the generators comes off the 500-volt busbars, through a rheostat similar to that used on the generator of the motor-generator. This rheostat is worked by the same lever by using a device for connecting either of the rheostats on to the lever as desired.

The installation at the Landres mines is a most successful one as regards good operation, the running of the machine being easy and regular, while the manipulation is both rapid and sure. All the slowing down and stopping movements can be carried out normally by the use of the single working lever, without needing to call upon the brake lever. Duration of the lift is from 28 to 32 seconds and the maneuvers average 8 to 12 seconds, giving an average value of 40 seconds for the trip. In average service 95 trips an hour are realized, and this figure alone is enough to show the great precision of the working and control of the present machine.

Several other mining-plant outfits are shown in the other illustrations. The plant at the Courriéres coal mines, France, is of interest from the use of exhaust steam coming from various steam engines, and the electric motors of the rotary groups are here replaced by low-pressure steam turbines, as shown in Fig. 2. Each group comprises one turbine and two dynamos with separately excited fields. Between the two groups is a flywheel which can be coupled on to either group. With this plant, the group used with the flywheel serves to send current into the cable-drum motor and the group runs at 1,500 revolutions per minute standard, allowing a 25-per-cent fall of speed so as to utilize the energy stored up in the flywheel. The second group is independent of the first and works at constant speed of 1,500 revolutions per minute, supplying direct current at 500 volts for various motors throughout the plant. Proper switch devices allow of throwing either of the groups on to the cable motor, and in such case both groups work under like conditions. Should the second group be used, the electric motors in the works which it fed are replaced by old steam engines. Turbines are of the Zoelly type, working at 1,500 revolutions per minute on constant speed or at 1,500 to 1,125 revolutions per minute on variable speed. The generators are connected in series for supplying the cable motor and have commutating poles. The flywheel is of forged nickel-steel, weighing 9.4 tons, and it reaches a peripheral speed of 430 feet per second. A Koepe drum of 21 feet diameter is employed here, and the machine can take out 200 tons of coal per hour from 1,300 feet depth in 48 trips. At each side of the Koepe drum is mounted a direct-current motor of 750 horsepower running on voltage variable from 0 to ± 500 volts, operating at 35 revolutions per minute, maximum speed.

Fig. 4 shows one of the cable machines mounted in the potash mines known as Kali-Sainte-Thérèse, Alsace, Germany. Four machines of this kind are in operation. They use a 16-foot Koepe drum working at 42 revolutions per minute. The motors of these machines are run from rotary groups on the Ward-Leonard system without flywheel, this being a very economical method wherever, as here, the variations of load are not objectionable.

Fig. 5 shows the machinery in the coal mines of Carmaux, France. Each machine is required to take out 130 tons of coal per hour from 1,450 feet depth in 43 trips, net load being 3 tons. These machines use flat cable of aloes fiber wound upon narrow drums. At each side is an electric motor (1,250 horsepower combined), working with current supplied by a rotary group, this latter being made up of two 500-volt direct-current generators and a 480-horsepower 5,000-volt three-phase motor working at 585 revolutions per minute.

Multiplex Radiotelegraphy.

Ricardo Moretti has recently patented a system of multiplex radiotelegraphy depending on selective resonance. A number of transmitters are arranged at the sending station so that variations of definite frequencies can be set up in the high-frequency current supplied to an oscillating circuit coupled directly or inductively to a single aerial. At the receiving station, there are connected in the circuit of a single wave detector, telephone receivers, each of which responds only to a tone of predetermined pitch. Transmission proceeds exactly as in wireless telephony, in that there are radiated from the antenna high-frequency oscillations which are changed in pitch by a microphone or other means. In one arrangement, Moretti uses a number (say three) of sound pipes each emitting a characteristic note when supplied with compressed air (under the control of switch keys). To permit of separation of the individual tones at the receiving station, a "monophone" is substituted for the ordinary telephone receiver. A monophone is, as it its name indicates, a telephone receiver, the diaphragm of which is set in vibration only by a certain definite frequency of stimuli. Each monophone at the receiving station reproduces only the signals sent out at corresponding frequency from the transmitting station, and thus as many messages can be sent simultaneously from, and received simultaneously, by a single aerial, as there are sound pipes and monophones.

In an alternative arrangement, Moretti replaces the sound pipe by electromagnetically operated tuning forks which, under the control of the several sending keys, set up intermittent currents of definite frequencies in the windings of a single iron core which actuates the diaphragm of a microphone in the antenna circuit. This arrangement is essentially that of a telephone relay, except that a number of relay windings are employed instead of a single winding. At the receiving station, the antenna is coupled inductively to a resonant circuit containing a thermo-electric detector, across which are shunted the three monophones. The latter analyze the complex oscillations received as in the previous case. Either of the systems described above is applicable to the simultaneous reception in one station of signals emitted by a number of stations.—*Electrical Review* (London).

A recent development in electrical auxiliaries to automobiles is an electrically heated glove for the chauffeur which is connected to the six-volt electric system of the car through contact plates on the steering wheel and glove.

Convention of the Independent Telephone Association of America.

The first annual convention of the Independent Telephone Association of America was concluded on Thursday, January 8, after a three days' session at the Hotel La Salle, Chicago. A report of the first three sessions of this meeting was given in our issue of last week. The total registration for the convention, including both members and guests, was about 375. All of the members and officers of the Association that attended the convention felt gratified at its success, which was phenomenal for an association organized but three months.

On Wednesday afternoon the session opened with an address by J. C. McCabe, Bay City, Mich., who spoke on "Publicity." He said that he had been a newspaper man for 25 years and a telephone man for but two years. In these last years he had put into practice many publicity ideas which had been of great value to his telephone company, particularly in enabling it to get a new franchise from the municipality on very favorable terms, because the publicity had paved the way for good will toward the company. He said that publicity is essential to every utility company and peculiarly to a telephone company. Publicity is of two kinds, deserved and undeserved. Unless the utility takes the public into its confidence it is liable to get considerable undeserved publicity, which will bring the ill will instead of the good will of the public. A good publicity department should be organized in any utility. It must have a most capable man at its head who should have charge of all advertising, give advice to the new-business department and cultivate friendly relations with all publicity mediums in the community. He must keep in close touch with the customers. Advertising is now to be regarded as an absolute necessity and really is an investment. Mr. McCabe quoted extensively from the writings of Elbert Hubbard to bear out his views. He strongly commended newspaper advertising as being most effective for utility companies. Such companies should be steady advertisers instead of doing a little work in this line now and then. Free publicity can readily be obtained in newspapers if items of general interest are supplied at the same time and if advertising is also carried in the papers. He cited the very effective publicity work of some large utility corporations. He advised against nonproductive advertising, which is a needless expense; among items of this kind he placed blotters, pictures and many novelties that carry little meaning with them.

The meeting then resolved itself into an experience session, presided over by D. M. Neill. Mr. Binkly, Hamilton, O., narrated the experience of his company in attempts to secure toll connections over the Bell lines to Cincinnati. The Public Service Commission of Ohio declared it had no jurisdiction to compel the giving of such service. The matter was then brought to the courts and has not yet been finally decided. He, therefore, introduced a resolution to instruct the officers of the Association to give assistance to companies having similar difficulties. This was referred to the Resolutions Committee.

W. F. Goodrich, La Crosse, Wis., told how physical connection had been working out in Wisconsin. The utility commission had found it lacked authority to compel this and therefore at a meeting of the Wisconsin State Telephone Association it was decided to urge the legislature to grant the needed authority to the Commission. This was done by unanimous vote of the legislature, since both the Bell and independent telephone interests had sought such legislation. However, subsequently a case brought before the commission in which it was sought to compel physical connection had been carried by the Bell interests to the courts, where final decision has not yet been rendered.

Improvement of Long-Distance Transmission.

H. T. Currier, of the Kellogg Switchboard & Supply Company, made an address on "The Little Big Things of Transmission." He said that although the great bulk of the telephone traffic is of local character, being confined within 100 miles of the exchange, he was convinced that all telephone companies will be called on in the future to carry more and more long-distance traffic beyond these limits. To enable a company to handle long-distance service it must have not only good line equipment but must have facilities to supply sufficient energy to overcome the losses on long lines. Each substation should be supplied with a minimum of 0.2 ampere. He told in a striking manner how iron line wire and poor station equipment cuts down the transmission very greatly; he emphasized this by citing many examples with figures of losses incurred due to improperly designed or defectively maintained equipment. Connecting cords are the very frequent cause of trouble in this regard; while these may not affect local traffic to a great extent, yet anything but the most perfect cords will seriously cut down transmission on long-distance lines. Therefore, for all toll circuits, it is necessary to use connecting cords that produce the minimum dissipation of energy. For such circuits No. 22 gauge cable is not desirable, as it produces a loss twice that of standard No. 19 gauge cable. The smaller telephone companies must standardize their equipment to produce better and more economical toll connection. It is possible to fix up switchboards for toll service quite easily at less expense than to rebuild the entire outside plant. For toll service 48-volt supply must be used in place of 24 volts. In order to insure that the proper cords will be used in putting up toll connections it is well to have jacks of different sizes for toll and local circuits.

Bernard C. Groh, of the Automatic Electric Company, also spoke along the same line, emphasizing the importance of getting the most perfect transmission possible. He defined what is meant by standard cable and other terms used in transmission discussions. He agreed with Mr. Currier's remarks. Both local and exchange batteries must be kept up if good results are to be obtained. Frequently the equipment may apparently give quite satisfactory local service but be entirely inadequate for toll service. In order to make sure that batteries and other parts of the equipment are not deteriorating so as to prevent good toll transmission, it is necessary to keep a close check on the lines and equipment by testing over an artificial line which can be easily constructed by the wire chief of the exchange. Another thing that compels more attention to improvements in transmission is the increasing use of repeating coils, because of the greater use of phantom circuits and the simplexing of circuits.

On Thursday morning the session opened with an address by Arthur Bessey Smith, of the Automatic Electric Company. He illustrated and described the elements of the automatic telephone system, particularly the calling device, the line, selector, side, connector and monitor automatic switches. He briefly referred to the advantage of an automatic traffic distributor and to the very effective way in which monitoring can be done by automatic equipment.

Telephone Service Standards.

J. C. Crowley, Jr., Superior, Wis., spoke of the action taken by the Wisconsin Railroad Commission on the standardization of operating rules and practice. The Wisconsin Commission had called a conference of all telephone companies in the state, which was held last September, about 70 out of 600 telephone companies being represented. There was a general discussion of the question of standards of service, as a result of which a preliminary code has been drawn up. While this has not been finally approved, being subject to another hearing on the question, it will in all likelihood be adopted with possible slight revision. Wisconsin is the first state to adopt such service standards for telephone service. The Commission will enforce these regulations liberally so as not to impose hardship on any company, and if conditions

warrant the standards would doubtless be revised. He recommended that the Association adopt these standards to be promulgated by its Service Department.

J. N. Cadby, of the engineering staff of the Wisconsin Commission, then spoke of the work done along this line. He said the final draft of the rules has not yet been prepared, since another hearing on the subject will be held on February 11 or 12. The effort of the Commission is to have rules that are fair and reasonable and particular care was exercised in drawing them up, since they probably will be a guide for other state commissions. The rules apply to both large and small companies, but are modified in the case of the latter, where conditions seem to warrant more liberal regulation. The preliminary draft of the rules was then presented by Mr. Cadby with an explanation of what was intended by each. A brief summary of these rules is as follows:

(1) All telephone companies must give good transmission, avoid cross talk, outside noise on the lines, etc.

(2) Not over 12 subscribers must be connected on any one line of ten miles or less in length.

(3) At least one trunk line must be provided for through traffic between communities.

(4) Frequent tests and inspection of the lines and equipment must be made to insure good service and maintenance.

(5) Exchanges must have sufficient equipment and of such kind as to provide for all traffic and also for reasonable extensions; traffic studies must be frequently made so that increase in traffic may be anticipated.

(6) Facilities must be at hand for emergencies; such as to have an extra operator ready to be called in exchanges where but a single operator handles the business.

(7) In exchanges having more than 500 lines at least 94 per cent of all calls must be answered by the operator within 10 seconds.

(8) Each company must adopt definite rules for the phraseology to be used by operators and a definite plan of operation must be put into practice; courtesy must be insisted upon on the part of all employees.

(9) Information must be readily and freely supplied to subscribers; telephone directories must be revised semi-annually in exchanges having more than 1,500 lines.

(10) The telephone directory must include instructions for subscribers as how to get the best results from the service.

(11) The rules and charges for toll service must be made public.

(12) A detailed and complete record of complaints and interruptions of service must be kept and all complaints must be investigated as soon as possible.

(13) Each telephone company must file with the Commission the name of the head of its complaint department.

(14) Toll service must be carefully checked up, properly timed, inspected and maintained.

W. N. Matthews, reigning Jupiter of the Jovian Order, then addressed the Association on the organization and work of the Order and on the value of being associated with it. In connection with the latter he cited a specific case wherein through the efforts of the Commercial Division of the Jovian Order the bad condition of the wiring in some 600 buildings in New York City was exposed. Although both the city's and the insurance inspectors were aware of this condition nothing had been done, and through the Jovian Order a co-operative plan was worked out whereby it was expected to compel the remodeling of the wiring in these buildings. Mr. Matthews referred to this as merely one instance of the broad co-operative work undertaken by the Order throughout every branch of the electrical industry, and urged the telephone men to join in with this work.

E. C. Lewis, of the Telephone Improvement Company, then explained with the aid of numerous illustrations the advantages of the Automanual telephone system and showed numerous exchanges in which it was employed. By showing a view of the operating room of the exchange when the old manual system was still in use and then later one after the Automanual equipment had been installed, he demonstrated very strikingly the saving in labor costs through the change.

H. N. Tolles, of the Sheldon School of Salesmanship, then made an illustrated address entitled "Business Building.' He made a very clever and energetic demonstration of the value of studying salesmanship in all business getting. He mentioned the many factors that are involved in successful work of this kind, among which he pointed out particularly a study of applied psychology, the study of human nature, careful training, etc.

The final session of the convention opened on Thursday afternoon with an illustrated talk by Mr. Ferris, of the Kellogg Switchboard & Supply Company, who showed many views in the manufacturing plants of this company.

W. F. Goodrich, La Crosse, Wis., then presented a paper entitled "How to Make a Market for Home Securities." He said that a utility should encourage home investment in its securities, particularly among its own customers, as this is a most valuable influence in developing good will toward the company. The financial manager of the organization is a most important official. He should be well known in the community and if possible should be a director. As to the types of stock issues that are to be preferred for local investment, common shares of the par value of $100 and preferred seven-per-cent shares of a par value of $50 will probably find the best market in the community. The company should approach as far as possible the idea of a mutual organization as its ideal. If investment is to be encouraged, regularity of dividends is necessary and under no circumstances should extensions be made from earnings before the dividends have been provided for. The financial department of a utility should encourage any legitimate publicity of the affairs of the company. Frequently sales of securities can be made to local investors through clubs, building and loan associations, friendly bankers, etc., but this does not mean that personal solicitation in this work can be dispensed with.

Resolutions.

The report of the Committee on Resolutions was then presented. The first resolution recommended was an affirmation of three resolutions that had been adopted by the Board of Directors on December 17, 1913, and which had been submitted to the Attorney General of the United States and were believed to be the basis of the offer made by the American Telephone & Telegraph Company; therefore, the officers of the Association were called upon to insist on the strict carrying out of these ideas and to aid in the enactment of legislation, if this should be necessary to put these ideas into effect. B. G. Hubbell explained this resolution by saying that the Association officials had been called upon to suggest how the difficulties of independent telephony could be overcome and the resolutions of December 17 were the result. He was asked some things in connection with the offer of the American Telephone & Telegraph Company, and explained what he understood to be the interpretation thereof. The resolution was then adopted unanimously.

Another resolution similarly adopted called upon the directors of the Association to secure such regulation of the telephone business as will insure freedom of development of telephone properties and will prevent absorption of local properties with the aim of a huge monopoly. The third resolution reaffirmed the belief of the Association in the value and importance of maintaining local telephone properties independent and urged support by the public of such utilities.

The fourth resolution urged the directors of the Association to try to insure competition in the invention, manufacture and sale of telephone equipment, so that all telephone companies may be at liberty to buy in the open market. Mr. Randall explained the meaning of this resolution to be an attempt to separate the American Telephone & Telegraph Company and the Western Electric

Company, and to thwart efforts to monopolize telephone manufacture. He explained further that it was hoped to bring about a condition such that independent manufacturers might be free to sell to Bell operating companies and thus keep the Western Electric Company from exacting exorbitant prices from the Bell companies so as to enable it to undersell independent manufacturers in the sale of material to independent operating companies and thereby decrease the market of independent manufacturers.

Another resolution directed the officers of the Association to help any independent telephone company to secure long-distance connection over interstate long-distance telephone lines. Other resolutions were also unanimously adopted thanking the officers and directors of the Association, the manufacturers who had made such a splendid exhibit, the Chicago press, the telephone journals, the Hotel La Salle and others who had contributed to the success of the convention.

John H. Wright spoke of the effort of the Finance Committee to raise funds that would insure the carrying on of the work of the Association. The dues of the Association are merely nominal and therefore it is necessary to depend upon companies to pledge something per month above their actul dues. Very valuable financial aid had been secured in this way from many companies and further efforts in this line were necessary in order that the Association may carry out all its plans. At the conclusion of Mr. Wright's appeal, a member called attention to the extremely valuable work that Mr. Wright had done at his own expense to help the Federal investigation of the telephone industry and to further the work of the Association in every way. On his motion, therefore, a special resolution thanking Mr. Wright for his service was passed.

The convention closed with a brief address by President Fisher, who cited the attendance, keen interest and excellent program of the convention, and the large amount of work accomplished by the Association as ample justification of its organization. He felt that it had brought new life and energy into independent telephony and therefore deserved the credit of the industry for these efforts.

Election of Officers.

Shortly before the close of the convention balloting for the election of officers took place but the count of the ballots was not complete at the time the convention adjourned. The election resulted as follows:

President: B. J. Hubbell, Buffalo, N. Y.

First Vice-President: E. B. Fisher, Grand Rapids, Mich.

Second Vice-President: E. D. Schade, Johnstown, Pa.

Treasurer: Richard Valentine, Janesville, Wis.

Directors for two years: R. Valentine, W. J. Uhl, G. W. Robinson, J. C. Casler, J. H. Wright, Samuel Hill.

Directors for one year: H. L. Beyer, T. J. Shefflin, L. A. Herrick, H. L. Reber, E. M. Cooke, D. M. Neill.

Directly after the announcement of the election, Mr. Hubbell, president-elect, modestly declined to serve, pointing out that Mr. Fisher had presided in such an able manner that to him should be given the honor of directing the efforts of the Association for another year. This Mr. Fisher has consented to do. At the annual meeting of the Association, which is to be held in Chicago on February 10, this election will be ratified.

An interesting feature of the convention was the promptness with which the sessions were called and adjourned. In order to get members into the meeting room at the time that the session was to begin stereopticon or moving-picture views were thrown on the screen, which quickly caused the gathering of the assembly. The chief entertainment feature of the convention was a sumptuous banquet given in the main banquet hall of the hotel on Wednesday evening. This was enlivened by a most entertaining program of music, song and nonsense by various speakers and entertainers.

Exhibits.

A very extensive exhibit of telephones and telephonic equipment was made on the seventeenth floor of the hotel, almost all of this floor being devoted to this purpose. Among the exhibitors were the following:

American Electric Company, American Steel & Wire Company, American Telephone Fire Alarm Company, Julius Andrae & Sons Company, Automatic Electric Company, L. S. Brach Supply Company, Century Telephone Construction Company, Coffey Audit & System Company, Frank B. Cook, Cracraft-Leich Electric Company, Dean Electric Company, Delta Electric Company, Electrical Contract Company, Ericsson Telephone Manufacturing Company, Hawker Brothers & Haviland, Kellogg Switchboard & Supply Company, Leeds & Northrup Company, Mathias Klein & Sons, Manhattan Electric Company, W. N. Matthews & Brother, Monarch Telephone Manufacturing Company, National Carbon Company, Naugle Pole & Tie Company, Northum Toll Register Company, Nungesser Battery & Carbon Company, Reliable Electric Company, John A. Roebling's Sons Company, Specialty Device Company, Standard Underground Cable Company, Stewart Brothers, Stromberg-Carlson Telephone Manufacturing Company, Swedish-American Telephone Manufacturing Company, Telephone Improvement Company, Utilities Service Company.

National Independent Telephone Association Convention.

The seventeenth annual convention of the National Independent Telephone Association was held at the Hotel La Salle, Chicago, on January 13, 14 and 15. The meetings were well attended and keen interest was displayed in all the proceedings. Practically all of the exhibitors that had made displays at the convention of the Independent Telephone Association of America during the preceding week again made substantially the same exhibits of telephone apparatus and supplies.

President Savage presided at all the sessions. The first session on Tuesday afternoon was devoted to a characteristically humorous and optimistic address by J. Adam Bede, of Minnesota. At the Wednesday morning session Richard Yates, member of the Illinois Public Utilities Commission, made an address on the work of that new regulatory body. William Fortune, of Indianapolis, then talked of the new federal income tax and efforts being made to improve its method of collection.

The chief feature of the Wednesday afternoon session was President Savage's annual address and a free discussion thereof, and of the independent telephone industry as a whole.

On Thursday morning there was held an important general conference on toll connections between independent and Bell telephone companies and on the recent agreement between the federal authorities and the American Telephone & Telegraph Company.

A detailed report of the convention sessions will be given in our next issue.

The Engineer's Part in the Regulation of Public Utilities.

During a reunion of the alumni of Stevens Institute of Technology, a meeting was held for the discussion of the engineer's part in the regulation of public utilities in the auditorium of the Institute, Hoboken, N. J., on the afternoon of January 9. The speakers included Alexander C. Humphreys, president of the Stevens Institute of Technology; Newcomb Carlton, vice-president of the Western Union Telegraph Company; John W. Lieb, Jr., vice-president of the New York Edison Company, and James E. Sague, of the Public Service Commission of New York for the Second District.

It is expected that the 60,000-horsepower Tata hydroelectric project in the Bombay Presidency, India, will be completed in February, 1914. The power will be transmitted to the city of Bombay where 31 cotton mills and three flour mills have already contracted to take energy.

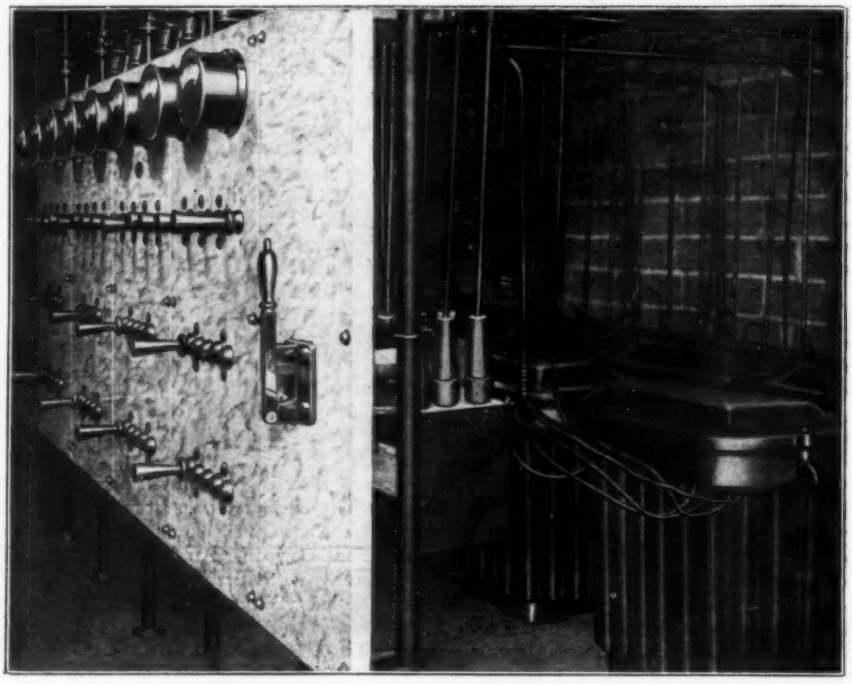
New Electrical and Mechanical Appliances

Regulator for Series Tungsten Lighting Circuits.

A great increase in the use of tungsten lamps for series street lighting has attracted attention to automatic regulators for such systems. In general these are of two types, one employing so-called shunt-box or adjuster sockets in connection with each of the lamps, and the other employing film cutouts at each socket and one adjusting or regulating device at the substation or generating plant. For the latter type of apparatus a standard type of constant-current transformer or regulator used so extensively in series arc lighting has been used, but the sluggish movement of the regulator has given rather poor regulation on many circuits with resultant decrease in the life of the lamps.

In order to provide a more sensitive and simpler control, specially suitable for series tungsten lamps, a regulating apparatus known as the "A-W" regulator has been meeting with considerable success. This equipment permits running series tungsten circuits from constant alternating-current supply mains, but unlike the arc-lamp regulator it provides almost instantaneous regulation without any moving parts whatever.

The A-W outfit, in the station type, comprises three parts. The first of these is the regulator, which is a transformer designed especially for close regulation. It is of the oil-filled, self-cooling type, mounted in an enameled cast-iron case. The transformer is equipped with a number of percentage taps which enable the circuit to be started with 50 per cent of the rated capacity of the regulator and adjusted to full-load conditions of power-factor and efficiency. At any adjustment of the load the power-factor remains about 80 per cent and the efficiency, even on small units, is about 96 per cent. Another use of the percentage taps referred to is for changing the current adjustment; thus in some installations 6.6 amperes is carried on the circuit until midnight and after that the current is reduced to 4.5 amperes. This practice results in considerable economy in energy and also lengthens the life of the lamps; this plan has been found better than cutting out a part of the lamps, since it requires no complications in the wiring of the conduit. The regulating transformer has distinct primary and secondary windings thoroughly insulated from each other to prevent any accidental ground on the primary circuit from being communicated to the series lamps.



Station Type Regulator for Series Tungsten Circuits.

The second part of this regulating outfit is known as the adjuster coil. This is an automatic inductive coil which provides the refinement in current adjustment in an electrical manner with the same effect as the mechanical adjustment in the ordinary series arc-lamp regulators. The coil is mounted in an iron case filled with an insulating compound. The third part of the equipment is the station panel which is of blue Vermont marble mounted on enameled iron pipe frame with wall braces and floor flanges. The size of the panel is 18 by 48 inches. Mounted thereon are two primary stab switches with receptacles, a five-gang circuit-adjusting switch and an ammeter for which there is an instrument thransformer on the back of the board. If desired, a watt-hour meter can be installed on the panel, room being left for this purpose. The primary switches have porcelain-tube receptacles with internal spring contact clips. An inclosed fuse is placed on each side of the primary line adjacent to the switch. The five-gang switch consists of five porcelain-tube receptacles of similar construction to those for the primary switches. These connect with the percentage taps and the transformer secondary.

The illustration shown herewith is of the control panels of what is said to be the largest installation of series tungsten street lighting in this country. Eight A-W regulators are used. The transformers of these are shown adjacent to the wall at the right.

The A-W regulator is manufactured by the Electric Appliance Company, of Chicago. A pole-type regulator similar to the station type described herein is also made by the same company.

Jewell Electric Elevator Controllers.

Among the automatic controlling devices for electric motors manufactured by the Jewell Electric Company, Mansay Building, Baltimore, Md., the new direct-current and alternating-current reversing elevator controllers are meeting with particular favor.

Fig. 1 shows the former of these which is known as the type LN elevator controller. Since experience has shown that failure of elevator controllers is usually due to the many small parts contained therein, the design of the Jewell elevator controllers has purposely been made as simple as possible so as to have the fewest number of parts. Thus, any of these parts that is liable to wear can be quickly detected and replaced without disturbing any of the electrical connections of the device.

One of the valuable features of the type LN controller is the vertical button contact design. Through this construction no floating particle or dust can lodge where they might interfere with proper operation of the controller. The contacts are all under spring pressure, so as to be free from jarring loose from vibration. Both sides of the line circuit are simultaneously opened by the main line switch, this reduces arcing to a minimum and insures long life to the contacts. Powerful magnetic blow-out coils are provided; these coils are mounted on the back of the slate panel to protect them from any possible injury.

The controller actuates an electric brake and also cuts out the series fields of the motor when full speed has been attained. The controller is designed to operate on a throw of 90 degrees of the controller shaft for an up motion of the elevator and similarly for the down motion. A sprocket of 22 teeth for No. 32 chain is furnished, but being made removable, can be replaced by a gear, where a direct connection to the shipper shaft is desired. The controller lends itself particularly well to ceiling installations, the iron frame being made reversible.

In Fig. 2 is shown the alternating-current type of elevator controller, which as to its reversing switch and contacts is similar to the direct-current controller. A distinctive feature of the alternating-current type is its freedom from magnets which have been found to lack the reliability of action so essential on elevator appliances. In this controller, alternating-current magnets have been replaced by positive mechanical means, thus permitting application of the controller or a wide range of voltages. In all the controllers the main line and reversing switches are placed on the face of the panel where their operation can be readily observed.

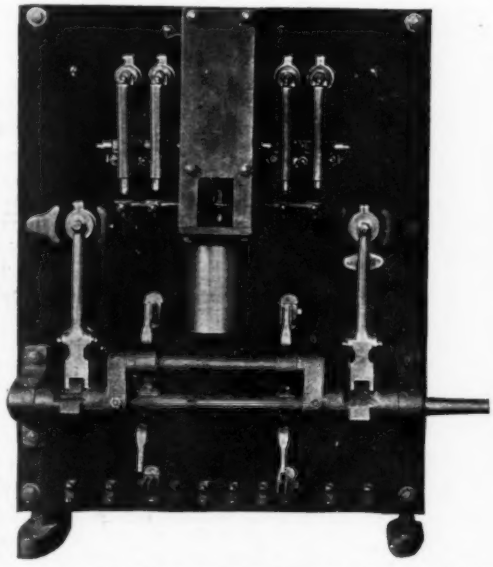


Fig. 1.—Jewell Direct-Current Elevator Controller With Reversing Switch.

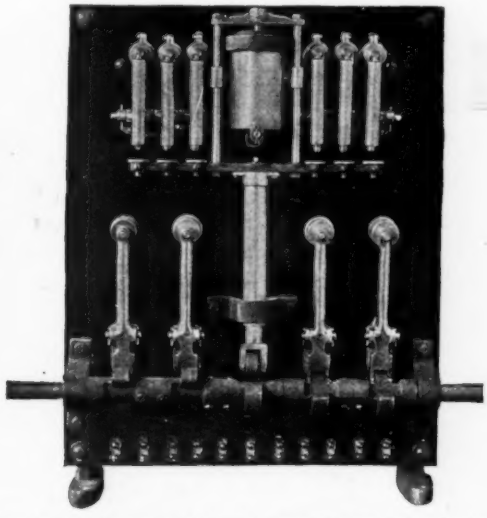


Fig. 2.—Jewell Alternating-Current Reversing Elevator Controller.

A New Carbon Battery.

The fascinating problem of producing electrical, direct from thermal energy continues to attract the attention of numerous investigators, and Baur and Ehrenberg (of Zürich) have succeeded in developing a carbon battery which, though of no industrial importance, is the only battery of this type which has yet yielded a reasonable electrical output. Hitherto iron and carbon cells of this type have employed an electrolyte of melted soda and have polarized rapidly when supplying current, owing to oxygen from the air being unable to reach the iron electrode with sufficient ease and rapidity. To overcome this difficulty, advantage is taken in the new cell of the fact that molten silver will dissolve large qnantities of oxygen. About two pounds of silver is melted in a thick-walled crucible (about four inches in diameter), and covered by a layer of molten electrolyte (say potassium silicate with 10 per cent of silicon fluoride). Pencils of carbon are plunged into the molten salts. Into the silver are plunged a nickel rod (insulated from the molten alkali by a porcelain tube) and a second porcelain tube for the oxygen supply. To prevent disintegration, the carbon rods are incased in porous shells of magnesia. With an effective carbon area of 17 square inches, such a battery will yield about 0.1 amperes for five hours, the internal resistance of the cell being 0.46 ohm and the temperature 1,000 degrees Centigrade. About one-eighth cubic foot of oxygen is required during this time. On open circuit, the battery electromotive force is 1 volt, but when delivering 1.2 ampere and 1.0 ampere respectively, the terminal potential difference falls to 0.9 and 0.54 volts.

Two New Applications of Magnetic Separators.

Removing iron particles from ground scrap rubber in the reclamation plant of a rubber mill and extracting the metallic iron from crushed slag in the steel plant are two new applications of magnetic separators that have recently been made. The separating is effected by simply passing the ground or crushed material on a belt over the magnetized pulley which picks out the metallic particles only.

The magnetic separators used were of Cutler-Hammer manufacture.

Electric Block-System Crossing Signal.

An ingenious type of highway-crossing signal is being used by the Lehigh Valley Railroad. This is an electric block-signal system used at crossings and of the same general design as that which is used along its entire line to control train movements, but it has in addition not only a visual signal, but also a powerful bell which rings loudly as trains approach. The signal is of the familiar banjo form. As the train approaches, a red disk appears and the bell rings continuously for several minutes before the actual arrival of the train, which may be more than a mile away when the warning signal is energized. The bell can be heard distinctly for a distance of some 500 yards. When no train is approaching the crossing, a white disk is displayed in the signal casing. At night time the signal is illuminated by a bright lamp shining continuously through either the red or white disk.

The signal is electrically operated. An approaching train automatically makes track connections which cause the red disk to swing into place and the gong to ring. As soon as the train has passed the crossing this connection is broken, the white disk replaces the red one and the bell stops ringing. The railroad officials say they are convinced that it is practically impossible for these signals to become deranged by anything short of actual demolition. If a circuit wire should become broken, either accidently or through tampering, the danger signal is immediately displayed.

Weatherproof Locked Socket.

The lamp lock known by the trade name "Shurlok" that was put on the market some time ago by Pass & Seymour, Incorporated, Solvay, N. Y., has met with exceptionally popular favor and has aroused a large and urgent

Weatherproof Locked Socket.

demand for its application to weatherproof sockets. To meet this demand the firm has developed a line of weatherproof Shurlok devices, of which the one shown herewith is the first one to be regularly listed; it is known as P. & S. No. 43,310. Although no publicity has as yet been given the new device, the company has already received orders for over 10,000 of the sockets from a few concerns that knew thereof.

In packing houses, damp basements, subways, tunnels, underground stations, etc., the new weatherproof socket with its unobtrusive, but effective, Shurlok is particularly suitable. The socket is of mica compound and this makes it not only moistureproof, but also rugged and strong, so as to be particularly adaptable in places subject to severe service.

Reflector Envelope Unit for Railway Car Lighting.

A railway coach is an expensive piece of equipment in which even the most

Reflector Envelope Unit for Car Lighting.

costly lighting units form but a small part of the total expenditure. Yet none of the conveniences with which railway cars are now equipped give more travel-comfort or are more necessary than light units correctly designed to meet the particular service requirements of railway work.

The new reflector envelope unit which has been developed by the Holophane Works of General Electric Company is a particularly interesting piece of lighting equipment, for it illustrates the care which railway men use in their lighting problems as contrasted to the careless ways of commercial lighting.

This reflector envelope unit is made up of a Holophane prismatic flanged reflector, and especially designed for car lighting from the center deck. A Druid glass envelope rests on the reflector flange and breaks up the high lights in the prisms, diffusing the light uniformly. A threaded metal fitter is spun on the Holophane reflector, a rubber gasket on the flange seals the envelope and reflector together at the bottom, and a metal collar, threaded over the fitter at the top, clamps the envelope and reflector together. The complete unit is sound mechanically, effective in light distribution, and beautiful in appearance.

Copper Production in Arizona.

With a mine producion of about 414,593,000 pounds of copper in 1913, Arizona led all other copper-producing states. The output in 1913 shows an increase of more than 49,000,000 pounds, or about 12 per cent over that of 1912, which was 365,038,649 pounds. As the price of copper was slightly lower in 1913, the value of the metal increased only about $3,500,000. There were 11 active copper smelting plants in the state, and ore and concentrate were also sent to 6 copper and lead plants in other states. Of the former, the greatest increases in output were made at the Hayden, Calumet & Arizona, Copper Queen, Old Dominion, Consolidated Arizona, and Swansea plants. At the United Verde and Detroit plants there was little change from the figures of 1912. Those making less copper were the Shannon, Arizona Copper, and Pioneer plants. New plants were completed by the Arizona Copper and Calumet & Arizona companies, and another was in course of construction for United Verde ores.

Simplex Foot-Warming Rug.

A convenient appliance to aid in carrying out the old suggestion "Keep your head cool and your feet warm" has been placed on the market by the Simplex Electric Heating Company, Cambridge, Mass. While intended originally to add to the comfort of winter riding in an electric automobile, it has also been found of great value in residences, offices, sanatoria, etc.

As shown in the illustration herewith, the Simplex rug is made as a Wilton carpet rug 15 by 27 inches in size. It is neatly bound and substantially made in every way. The heating unit is especially rugged and will outlast the carpet covering; the rug may be walked on indefinitely without injury. The design is such that the rug does not produce danger from fire or overheating. It is ready for immediate use by merely plugging into the circuit. The rugs are made for various voltages, although 110 is standard for house service and 75 for an 80-volt electric car. The power consumption is 100 watts.

For the electric automobile the Sim-

Simplex Foot-Warmer Rug.

plex rugs are a great convenience at relatively low energy cost. Particularly is this true when the passengers are going to a dance or other social function for which heavy footgear would be out of place. The new rug dispenses with the various troublesome expedients formerly used as foot warmers for carriage and vehicle use. The rugs are made in various colors, but unless otherwise specified gray is supplied.

Electrose Arcover Line and Strain Insulators.

Louis Steinberger, an inventor well known in the insulator art, has succeeded (after a vast amount of labor and costly experimenting, having had to overcome seemingly insurmountable difficulties) in producing on a commercial scale what are believed to be absolutely reliable suspension line and strain insulators for every voltage. These "Arcover" insulators are said to meet every requirement in a highly satisfactory degree. Their very remarkable efficiency will doubtless at once receive due recognition from leading engineers and electrical manufacturing and constructing companies in all parts of the world.

These Arcover insulators are the only insulators with imbedded interlinked strain or suspension members that are made up of a single, integral and uniformly solid mass of insulating material without joints. Even though the insulating material should become totally destroyed, the line cannot possibly fall to the ground.

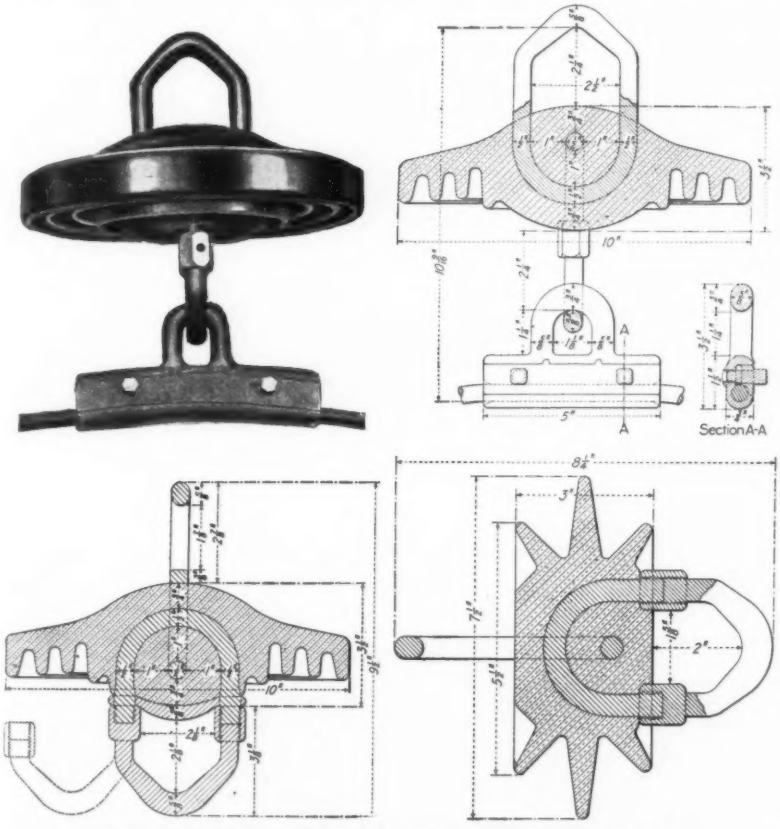
The electrical and mechanical values of these insulators have been worked out to a degree of perfection never before attained in this class of devices and are far in excess of ordinary requirements. Therefore they are especially well adapted for applications where unusually severe conditions prevail. These Arcover insulators possess a number of original and desirable features. Two or more units may be connected or disconnected in a fraction of a minute, no special tool being required; a plain wrench, a nail or even a piece of wire is all that is needed. No extra connecting member is required and there are no loose parts to be lost. The spacing of the units in their relation to each other has been worked out on scientific lines, to the best possible advantage.

The novel form of line clamp shown in connection with the Arcover insulators is also an invention of Mr. Steinberger, and possesses many admirable features; it has a smooth bore for gripping the wire or cable, thereby preventing crystallization and the possible breaking of the conductor at or near the clamp. It is designed so as to grip conductors of various diameters. It is light in weight, but sufficiently strong to break the conductor before slippage occurs. The metal parts employed in all these insulators are made of galvanized drop-forged steel.

In the table below are given the remarkable electrical and mechanical values of the 10-inch Arcover disk suspension and strain insulators, also of the 7.5-inch Arcover disk strain insulators:

	7.5-Inch Disk Strain Insulator	10-Inch Disk Strain and Suspension Insulator
Puncture value, in oil	120,000 volts	150,000 volts
Tested to dry arc value	74,000 volts	100,000 volts
Rain arc value	55,000 volts	55,000 volts
Line voltage	25,000 volts	25,000 volts
Mechanical value.	20,000 lbs.	20,000 lbs.
Tested to	10,000 lbs.	10,000 lbs.

Arcover disk strain insulators are made in the following diameters: 5.5, 7.5, 10.5, 12.5 and 14.5 inches. Arcover disk strain and suspension insulators are made in the following diameters: 8, 10, 12, 14 and 16 inches. These insulators are made by the Electrose Manufacturing Company, 60 Washington Street, Brooklyn, N. Y., of which Mr. Steinberger is president.



View and Sections of Electrose Arcover Line and Strain Insulator.

A Combined Telephone and Megaphone.

For marine work the use of the telephone is already well recognized and there are numerous types of loud-speaking telephones now in operation on board ship. Reference may, however, be made to the "Telemeg," which is made by Kelvin, Bottomley & Baird, Limited, of Glasgow, Scotland, inasmuch as this differs somewhat from the types of instruments usually made. The ordinary loud-speaking telephone is simply a heavily constructed telephone with excessive battery power behind it. In such instru-

Combined Telephone and Megaphone for Shipboard Use.

ments the loudness of speech is obtained because of the exceptionally heavy currents which pass through the speaking circuit. The Telemeg, which is a shortening of "telemegaphone," combines the principles of the telephone and megaphone. Speech is transmitted electrically from the sending station, which may be the bridge of a ship, to the receiving station, say the forecastle, and is there emitted in extremely loud tones from a specially formed trumpet-orifice or megaphone. Only a minute current passes through the speaking circuits of the instrument, the loudness of speech being obtained by the combination of a specially constructed microphone with the megaphone orifice. The value of this will be seen when it is remembered that heavy currents passing through the speaking circuit of any telephone system are destructive as they cause undue heating and burning of the carbon granules which transmit the current in the microphone. So much is this the case that some telephones are provided with devices for frequently shaking up the carbon granules so as to bring new surfaces into contact as the older ones become deteriorated by overheating. With the Telemeg the maximum speaking current is being passed continuously for days and weeks without any deteriorating effect at all, and hence there is no occasion to provide a device for periodically rattling the microphone so as to rearrange the carbon granules in the manner described above.

Another frequent source of trouble common to telephones is dampness. Any moisture around the carbon granules entirely destroys the speaking qualities of the apparatus. Hence marine telephones are usually inclosed in water-tight casings. In the Telemeg, on the other hand, while the outer casing is quite water-tight, the microphone itself is contained in a sealed metallic capsule and is thus absolutely water-tight. It may, for example, be taken out of the outer casing, immersed in water and replaced, when the speaking qualities of the apparatus will be found to be quite unimpaired. The gear which is shown in the illustration has been subjected to exhaustive tests for a period of several years and can be said to replace the old fashioned form of telegraph operated by chains between one station and another. These telegraphs could only be used to signal about half a dozen phrases and usually work out at a considerably higher price than the electrical apparatus above described. It therefore warrants the attention of all up-to-date shipbuilders and owners.

Copper Exports.

Exports of copper for the week ending January 8 totaled 12,689 tons; same period last year, 6,147 tons.

A New Forged-Steel High-Tension Insulator Pin.

Hubbard & Company, Pittsburgh, Pa., announce the addition of the Hubbard forged-steel high-tension pin to the well known Hubbard array of pole-line hardware. This pin was developed to overcome the inherent defects of the old types of malleable and cast-iron supports for high-tension insulators, and is said to be by far the lightest, strongest and cheapest pin of the center-bolt separable-thimble type on the market. The strength of all other separable thimble pins is limited to the bending strength of the center bolt at the point of contact between the thimble and the main casting, and the diameter of this bolt is in turn limited to three-fourths inch by the fact that the bolt must be small enough to screw into a cast thimble of not over 1.125 inches, outside diameter, in order to permit cementing into a 1.375-inch pin hole.

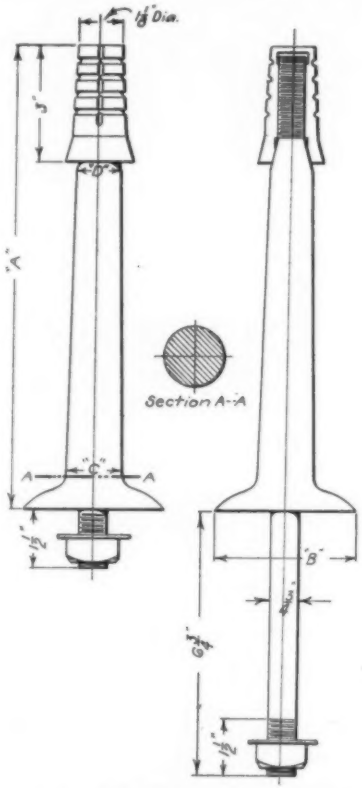


Fig. 1.—Two Styles of Hubbard Forged-Steel Pin.

In the Hubbard forged-steel pin the tapered collar of the thimble, which is of malleable iron, greatly reinforces the pin at its smallest diameter, thus allowing the use of the standard type of thimble without any reduction in the strength of the pin. When a stress is applied to a pin having a long center bolt, the bolt will stretch considerably, allowing a deflection, which in one case amounted to 5.5 inches under a horizontal pull of 1,750 pounds, while a forged-steel pin subjected to an equal stress deflected only one-fourth inch.

The Hubbard forged-steel pin is made in two styles, shown in Fig. 1, the long-shank pin for use with wood or channel steel arms, and a short-shank type for use on arms of angle section, including the Hubbard "Bo-Arrow" arm and high-tension extension. Fig. 2 shows a Bo-Arrow arm equipped with the new pins.

There are no welded joints in this pin, as it is forged from a solid bar of open-hearth steel, thus insuring freedom from flaws. It can be furnished plain or galvanized to meet the National Electric Light Association test in seven sizes, ranging from 6 to 16 inches in length. It can be furnished on shorter notice than can a cast article, and if desired in any variation from standard sizes.

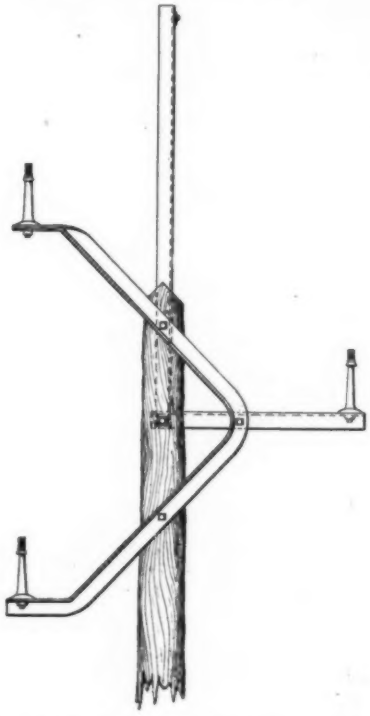


Fig. 2.—Bo-Arrow Arm Equipped with the New Steel Pins.

The malleable thimble used with the forged-steel pin is also used with the high-tension channel steel clamp pin for wooden and angle steel arms and with the various types of pole-top pins manufactured by Hubbard & Company. All of these pins, together with the Peirce cone type sheet-steel pin, are described in the Hubbard "Reference Book of Transmission Line Construction," which is at last ready for distribution, having been held up from time to time for the inclusion of new data.

Johnson Wire Puller.

A very convenient and extremely valuable tool has been invented by M. E. Johnson, 5514 Lowe Avenue, Chicago. Mr. Johnson has patented this device and is its sole manufacturer. In the accompanying illustration (Fig. 1) is shown a view of one of these tools that has been in service for many months. It is a modified form of pliers in which one jaw is provided with a cam extension. The method of using the tool is shown in Fig. 2. The tool is well adapted for all exposed wiring and also is a great aid in knob-and-tube wiring. It is particularly designed to tighten each stretch of wire with the utmost speed and convenience, and its use insures extremely neat and rapid work.

The insulator or cleat is set in place, the screw or nail holding it partly driven, and the wire slack is pulled up by hand in the usual manner. In order to tighten the wire the Johnson wire puller is applied at either the right or left side; it is necessary merely to give it a turn whereby it rolls on the cam-shaped pulling block until the required tension is obtained. Holding the tool in this position with one hand, the screw or nail is then driven home. On releasing the wire puller, the cleat

Fig. 1.—Johnson Wire Puller.

or knob is not pulled back by the wire because any slack in the setting of the insulator has already been pushed back to the limit by bracing the wire puller against it. This eliminates the sagging back of insulators commonly noticed in work of this kind and which gives the wires the appearance of being loose.

The new tool can be used in many places where ordinary methods of tightening the wire are impossible. For example, it is very serviceable where an obstruction prevents access for gripping the wire with any other device but the new wire puller. It is also very convenient in working be-

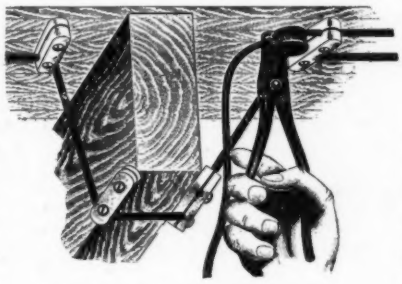


Fig. 2.—Method of Using Puller.

tween joists or beams. Its use does not mar finished ceilings or wires, and does not injure the insulator. It makes an extremely neat job and results in such saving of time that, according to the manufacturer, its low cost is very soon paid for.

Orr & Lockett Drilhammer.

For drilling holes in any material except wood and metal, a new tool has been placed on the market called the Drilhammer. This is of unique construction in that it is a very compact and powerful tool which the manufacturers say is extremely effective on account of the principle used in its operation. By means of centrifugal force two hammer elements are revolved so as to deliver upwards of 975 blows per minute upon the drill.

The tool has a one-piece malleable handle, giving a strong and steady grip. A crank is mounted on a steel cut spur gear which meshes with a small pinion on the main shaft of the tool. This carries a steel spider, at each end of which is pivoted a hardened tool-steel hammer element. Since these hammer elements are free to swing upon the spider, on revolution of the latter they are thrown out by centrifugal force and revolve in their extended position with the spider. As each element reaches the point at right angles to the axis of the drill it strikes the end of the drill with full force. Since it is pivoted on the spider it swings away from the end of the drill so as to pass the latter on continued revolution. The other hammer piece likewise strikes a vigorous blow when it swings around to the end of the drill.

Thus, for every revolution of the spider two blows are given to the drill. The gear ratio of the drill is 1 to 6.25, and, therefore, by every turn of the crank practically 13 blows are given to the drill. On a small machine an operator can easily make 75 turns of the crank per minute. Consequently, he can deliver from 975 to 1,000 blows per minute. In a smaller machine the diameter of the spider is four inches; consequently at a speed of 75 revolutions per minute the hammers travel at the rate of 468.75 feet per minute, which is such a high velocity as to deliver very powerful blows upon the drill end.

The manufacturers claim that this drill delivers more blows per minute than any other similar tool on the market. It is also claimed that the rapid crumbling strokes delivered make clean holes in the shortest possible time. The tool is made of very rugged construction so as to be substantially indestructible. Since it has no springs there is nothing to adjust or deteriorate. Its operation is extremely simple and it can be put to use without preliminary experience.

Two sizes of Drilhammer are made, the smaller size is used for holes ranging from one-fourth to five-eighths inch. The second size is used for drilling holes from one-half to one and one-quarter inch. The tools accommodate any style drill used in such work. An extension can readily be applied to

Orr & Lockett Drilhammer.

brace the Drilhammer against the ceiling or in any other position where it cannot be readily held by the operator. This extension is particularly serviceable for electricians.

A view of one of these devices is shown in the illustration.

The Drilhammer is manufactured and sold by the Orr & Lockett Hardware Company, 14 West Randolph Street, Chicago.

Latest Approved Fittings

ATTACHMENT PLUGS, Fuseless.—H. T. Paiste Company, Philadelphia.

Edison-base type, 660 watts, 250 volts, catalog No. 400.

Approved December 6, 1913.

ATTACHMENT PLUGS, Fuseless.—The Trumbull Electric Manufacturing Company, Plainville, Conn.

"Trumbull" 660 watts, 250 volts.

Separable attachment plugs, catalog Nos. 785, 786.

Approved December 16, 1913.

CABINETS.—Metropolitan Engineering Company, 1238 Atlantic Avenue, Brooklyn, N. Y.

Steel cabinets, catalog Nos. 2-Std., 935 and 954, with sheet-metal meter adapters for inclosing the connections to meters, also four-inch to ten-inch sheet-metal connectors.

Must be installed with the surfaces beneath the meter adapters covered with sheet metal at least one-sixteenth inch thick.

Approved December 6, 1913.

Attachment Plugs.—Trumbull Electric Manufacturing Company.

CUTOUT BASES, Cartridge Fuse.—The Trumbull Electric Manufacturing Company, Plainville, Conn.

Porcelain base:

250 volts, 0-30 amperes, catalog Nos. 19 353, 21 353, 21 653, 21 993, 25 693, 25 873, 29 653, 80 423.

250 volts, 31-60 amperes, catalog Nos. 19 365, 21 365, 21 656, 21 996, 25 696, 25 876, 29 656, 80 426.

600 volts, 0-30 amperes, catalog No. 25 694.

600 volts, 31-60 amperes, catalog No. 25 697.

Slate base:

250 volts, all capacities, catalog Nos. 8000-05 inclusive, 8010-15 inclusive, 8019, 8021-25 inclusive, 8030-35 inclusive.

600 volts, all capacities, catalog Nos. 8050-54 inclusive, 8060-64 inclusive, 8070-74 inclusive, 8080-84 inclusive.

Approved December 6, 1913.

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

HEATERS, Electric.—General Electric Company, Schenectady, N. Y.

"G.E." soldering irons, types 1-8 to

Soldering Irons.—General Electric Company.

1-12 inclusive, 75 to 275 watts, 95 to 250 volts.

Portable electrical heating devices of this class present certain inherent

Receptacles for Attachment Plugs.—National Metal Molding Company.

hazards. The temperatures necessary for their normal use are high enough to cause fire if they are left in contact with combustible materials. As yet no adequate means have been brought forward for eliminating such hazards.

The general design and workmanship

Pull Switch.—Bryant Electric Company.

shown in the construction of these soldering irons are satisfactory.

Approved November 17, 1913.

RECEPTACLES, For Attachment Plugs.—National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

"National" receptacles for attachment plugs, 660 watts, 250 volts.

Outlet box receptacles, catalog Nos. 390 and 390-A.

Molding receptacles, catalog Nos. 360 and 360-A.

Approved December 6, 1913.

RECEPTACLES, For Attachment Plugs.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

"C-H," 10 amperes, 250 volts.

Concealed, catalog Nos. 7,616, 7,617, 7,655.

Molding, catalog Nos. 7,621, 7,622.

Flush receptacle, catalog Nos. 7,611, 7,612.

Approved December 6, 1913.

SWITCHES, Combination Cutout.—H. T. Paiste Company, Thirty-second and Arch Streets, Philadelphia, Pa.

"Paiste" panel cutout and service entrance switches, second and third wire.

Receptacle for Attachment Plugs.—Cutler-Hammer Manufacturing Company.

Panel cutout, Elison plug fuse bases and knife switches, 30 amperes, 125 volts, catalog Nos. 4,012-16 inclusive, 4,025.

Approved December 5, 1913.

SWITCHES, Surface Snap.—The Trumbull Electric Manufacturing Company, Plainville, Conn.

Double-pole, 10 amperes, 250 volts, wing handle, catalog No. 7,456.

Approved December 10, 1913.

SWITCHES, Fixture.—The Bryant Electric Company, Bridgeport, Conn.

Chandelier switches:

"Wrinklet" pull switches, one ampere, 250 volts, three amperes, 125 volts, catalog No. 456.

Approved December 6, 1913.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

MARTINSBURG, W. VA.—The Martinsburg Power Company will enlarge its power plant.

SHERWOOD, N. D.—C. H. Budke will install an electric light plant here next summer. C.

MINDEN, IOWA.—A $7,000 municipal light plant will be established. Address the city clerk.

GALT, MO.—A municipal light plant will be established. Address the city clerk for particulars.

DeRIDDER, LA.—DeRidder Light & Power Company is planning to erect a $30,000 power plant here.

SIOUX CITY, IOWA.—Sioux City Gas & Electric Company will spend about $100,000 enlarging its plant next year.

DE GRAFF, MINN.—An electric light plant will be established here. Address C. D. Neenan, village recorder.

CALGARY, ALTA.—The Eau Claire Lumber Company is considering the erection of an electric power plant here.

DAYTON, WASH.—Jacob Weinhard is considering the installation of an electric light and heating plant in this city.

DENNISON, IOWA.—Bonds will be voted for the construction of an electric light plant here. Address the City Clerk for desired information.

SHEBOYGAN, WIS.—The city has asked permission to establish a municipal lighting plant here. Address the city clerk.

SHERIDAN, MONT.—The Chamber of Commerce has started a movement for ornamental lighting. Address the city clerk.

MUSCATINE, IOWA.—The Citizens Light & Power Company will make improvements. Address Frank T. Hulswit, president.

LANSFORD, N. D.—The Council is planning to construct an electric light plant here. Address the city clerk for particulars.

GLENDORA, CAL.—Bids will be received until February 12 for a franchise to operate an electric distribution system in this city.

ADRAIN, MINN.—Business men headed by M. E. Mehrten are raising funds for an ornamental street-lighting system. C.

TYLERTOWN, MISS.—The Tylertown Light & Power Company is planning to purchase and install a 60-horsepower engine.

SPENCER, S. D.—A movement has been started for a transmission line from Salem to this place, the estimated cost of which is $400. C.

GRIMMES, IOWA.—$4,000 in bonds will soon be voted for the construction of electric light plant here. Address A. E. Larson, town clerk.

DELL RAPIDS, S. D.—N. C. Draper has been granted a franchise for electric lighting and power. Address James Ridlington, city auditor.

SUMAS, WASH.—The Public Service Commission at Olympia has ordered improvements and alterations to be made in the electric system here. O.

MADISON, GA.—The Electric Light Commission is contemplating rebuilding half of its transmission line. Address G. W. Hubbard, superintendent.

MONROE, N. Y.—Permission has been granted to the Orange & Rockland Electric Company to erect poles, wires and other appliances in this town.

HERINGTON, KANS.—The Council is planning ways and means to secure $49,000 for improving the light and water plant. Address the city clerk.

GLYNDON, MINN.—The Glyndon Light & Power Company has been incorporated with a capital stock of $5,400 by A. J. Fitzsimmons and others.

SAN DIEGO, TEX.—The San Diego electric light plant has been sold by S. G. Smith to Arthur Blankenship, who will make improvements to the plant.

MT. CARMEL, PA.—The Edison Electric Light Company is thinking of an addition to its plant at this place. Address W. Keiser, superintendent.

EAST ORANGE, N. J.—The Real Estate Brokers' Association of East Orange has appointed a committee to arrange for improved lighting facilities on Park Avenue. A.

WORCESTER, MASS.—The Street Lighting Committee has recommended installing 389 additional electric street lamps. Address H. A. Kinglet, superintendent.

GALENA, KAN.—The Empire District Company has been granted permission by the Public Utilities Commission to issue $120,000 worth of bonds for improvements. M.

ANTIOCH, CAL.—The Great Western Power Company has been granted a permit to run a high-voltage power line from the eastern to the western town limits.

BELLINGHAM, WASH.—The Skagit Power Company has been granted a 50-year franchise and will construct power plants in the upper Skagit and Cascade River region.

ROBINSON, KANS.—C. I. Stocking, superintendent of the Northeast Kansas Telephone Company, is making preliminary plans for the installation of an electric light plant.

WASHINGTON, N. C.—Gilbert C. White, engineer of Charlotte, has prepared plans for an electric light and water works plant to be constructed here at a cost of $160,000.

WAYLAND, N. Y.—Wayland-Steuben Power Company, Incorporated, has been incorporated with a capital of $50,000 by V. M. Kimmel, J. Kimmel and O. F. Kiefer, Wayland.

SOUTH PASADENA, CAL.—The Los Angeles Gas & Electric Company has been granted a certificate of public necessity and convenience to operate under franchises in this city.

WASHINGTON, PA.—Robert P. Reed, of this city, has the plans for a building which will be erected by the Relief Electric Light & Power Company for the generation of electric power.

GOSHEN, IND.—After some experience with a private lighting corporation the city of Goshen has arranged for a $35,000 temporary loan to pay the expense of reconstructing the municipal lighting plant.

BOWLING GREEN, KY.—This city is contemplating enlarging its electric light plant so as to provide current for the operation of an ornamental lighting system which will be installed in the business section. G.

MANHATTAN, KANS.—The Rocky Ford Power Company is to build a line west to Riley and north to Leonardville, and will provide light and power for those towns. Dr. C. K. Raber is president of the company. M.

MT. CALVARY, WIS.—The management of the St. Lawrence College at Mt. Calvary is now making plans for the installation of a new lighting system at the college during the summer vacation. Address Rev. B. Schmitz.

LOUISVILLE, KY.—George E. Woodruff & Company, Louisville paint dealers, are planning the establishment of a paint factory, and in that event will require motors for the operating of grinding and mixing machinery. G.

SHASTINA, CAL.—The Railroad Commission has rendered a decision allowing the California-Oregon Power Company to serve electricity in the towns of Shastina and Edgewood under rates which it had previously put into effect.

SEDRO WOOLEY, WASH.—The City Council will install a $2,500 cluster-lighting system on Metcalf Street, from State Street to the Great Western crossing. The Northwest Traction Company will furnish the current.

MILFORD, PA.—The Shohola Falls Hydro-Electric Company is contemplating the erection of a hydroelectric plant on the Delaware River near Belvidere, N. J. The stock of this company was recently increased from $6,000 to $500,000. N.

COLUMBUS, O.—Representatives of North Side civic and commercial organizations are back of a movement to secure the extension of the High Street cluster-lighting system rom Fifth to Chittenden Avenues. Address the city electrician.

DEADWOOD, S. D.—The Homestake Mining Company, of which T. J. Grier is superintendent, will build this year a steam-electric generating plant of 3,200 horsepower to cost $45,000; a boiler plant at an estimated cost of $100,000 and a new hoist. C.

SIOUX CITY, IOWA.—Enlargements of the Sioux City Service Company's

plant and equipment during 1913 cost approximately $191,000 and about the same amount will be expended for improvements this year. Address E. L. Kirk, general manager.

BARBOURVILLE, KY.—The Barbourville Electric Light & Power Company has plans for enlarging its electric light plant, a new franchise which it sought having been granted. New generating equipment, as well as transmission apparatus, will be required. G.

COLUMBUS JUNCTION, IOWA.—The citizens of this city decided to grant the Miller-Edwards Electric Light & Ice Company, of this city, a franchise to wire the town and establish electric lights. Work will probably begin at once and the service soon be established.

WILLIAMSBURG, IOWA.—Frank Gue of Keota has purchased part of the canning company's buildings and also the lighting franchise voted to the company by Williamsburg. He will install an electric-light system and hopes in the future to extend it to Conroy and Parnell.

TULARE, CAL.—A survey is now being made for a new transmission line for the Mt. Whitney Power & Electric Company from No. 3 plant to Lindsay. This will be a steel tower construction following the present line to Lemon Cove, thence in a straight line to Lindsay.

PATON, IOWA.—This city proposes to obtain electric power by building a transmission line to connect with the Central Iowa Power Company. W. H. Grover, of Ames, Iowa, has been authorized to prepare a preliminary report and if the project is feasible, plans and specifications.

GARDEN CITY, KANS.—A municipal electric light plant is to be built here, an injunction suit brought against the city to prevent a bond issue to cover the expense of erecting the municipal plant having been recently dismissed in the Federal courts. A "White Way" will be constructed. M.

LAKE VIEW, IOWA.—The town voted on January 14 upon an issue of bonds for the purpose of installing a transmission line to Sac City, a distance of 10 miles, and also a local distribution system. Plans and specifications will be prepared by W. H. Grover, of Ames, Iowa, who has been retained as engineer.

PHILADELPHIA, PA.—Preparatory to the installation of tungsten electric lighting as a substitute for gasoline and arc lamps Director of the Philadelphia Department of Public Works Cooke has made public some of the plans for a change in 4,000 gasoline lamps to electricity, and 700 arcs to incandescent globes. N.

WESTFIELD, MASS.—The Municipal Light Board will at once purchase a 300-horsepower boiler and a 500-kilowatt generator. The town has voted $25,000 for the purpose. Further increases in the plant are likely in the near future owing to the great growth in the business through the sale of power to numerous manufacturing plants in the territory. W.

LAPWAI, IDAHO.—It is expected that active measures will be taken soon for the construction of an electric lighting system in this city. A franchise has been asked of the Municipal Board by the Lewiston Electric Light & Power Company, which, if granted, will enable the company to extend its light and power lines from Lewiston to this city, within six months. O.

WEEDSPORT, N. Y.—A petition signed by 121 taxpayers has been submitted to the village clerk asking for a special election on a proposition to bond the village for $15,000 for the erecting of a municipal lighting plant. The taxpayers voted in favor of a municipal plant a year ago, but it was found that the system would cost more than the bond issue specified.

REDDING, CAL.—The Railroad Commission has granted a certificate of public necessity and convenience to the California Power & Manufacturing Company to sell power in the territory which can be served from the existing plant of Florin Brothers at Fall River Mills. The effect of the decision is to leave a large section of territory open to both the California company and the Pit River Power Company, which have applied simultaneously to serve the section.

PHILADELHPIA, PA.—Charters issued by the State Department December 31 for the incorporation of eleven electric companies to operate in Bucks County is declared to be the forerunner of an important plant which may eventually supply light, heat and power to Philadelphia. The incorporators of the new company are S. D. Warriner, Philadelphia; Rollin H. Wilbur, St. David's, and P. F. Baker, Germantown, leading officials in the Lehigh Coal & Navigation Company.

DES MOINES, IOWA.—The Des Moines Electric Company will begin construction of a high-tension power line from Des Moines to Oskaloosa next spring, to light the streets of Oskaloosa and operate the street railway and interurban. The Illinois Traction Company owns the franchise. This company also owns the Des Moines Electric Company, and it intends to make the Des Moines plant supply light and power in the half dozen Iowa cities in the center of the state in which it operates. High-tension lines will be extended from Des Moines to several other cities next spring.

OLYMPIA, WASH.—Acceptance of the 50-year franchise granted to the Washington Public Service Company by the County Commissioners to build and operate a system of electric light and power lines to parts of Thurston County has been made. Proposed lines will extend from this city, through Tenino, to Grand Mound, thence to Gate, the purpose being to furnish electric light or power to the small towns and farmers enroute. According to the terms of the franchise, construction must begin not later than December, 1914, and the system completed and in operation by January 1, 1916. The Washington Public Service Company has a franchise to establish an electric power plant and a central system in this city. It is understood that active operations will begin in the immediate future. O.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

TROY, N. Y.—The City will install a new fire-alarm, telegraph and police-signal system here. Address the city clerk.

EL CENTRO, CAL.—The Imperial Telephone Company is preparing to extend its service to the town of Bernice.

MONTEVIDEO, MINN.—Citizens Telephone Company has been granted a franchise here. A. M. Parks is city clerk. C.

VENTURA, CAL.—The Pacific Telephone & Telegraph Company has been granted a 30-year franchise to operate in San Buenventura.

EMAUS, PA.—The Council is considering the installation of a standard fire-alarm system.

CHICOPEE, MASS.—The Council may establish a police telephone system. Address Frank A. Rivers, mayor, in regard to the matter.

FAIRMONT, W. VA.—The City Council has granted a franchise to the Central District Telephone Company to lay an underground system.

KREM, N. D.—The Mercer County Telephone Company will build a line to Hazen, and in the spring a line will be built from Stanton to Hanover. C.

LOGANSPORT, LA.—R. W. Caraway, Thomas Russell, Sr., and others are planning to install a telephone exchange at this place in the near future.

DEER RIVER, MINN.—Northern Minnesota Telephone Company has organized with Frank Russell as president C.

TEMPLE, TEX.—The United Telephone Company is making improvements and enlarging its plant here at a cost of $3,000. The switchboard will be enlarged and new cable strung. D.

SILVER CITY, N. M.—The Mountain States Telephone Company is considering the installation of a telephone line to Mogollon, and the establishment of an exchange in that camp.

EAGLE ROCK, CAL.—The Pacific Telephone & Telegraph Company has been granted a certificate of public necessity and convenience to operate in this city.

SPIRITWOOD, N. D.—The Winfield Township Farmers Club has purchased a telephone line and has incorporated the Winfield Rural Telephone Company. Improvements will be made.

DODGE CITY, KANS.—The Arkansas Valley Telephone Company has received permission to construct a new exchange at Dodge City, and otherwise improve its plant until it has an aggregate value of $60,000. M.

DALLAS, TEX.—The Dallas Automatic Telephone Company has increased its capital stock from $900,000 to $1,000,000 and will make extensive improvements and addition to its present plant and system. D.

TRAVERSE CITY, MICH.—The citizens plan to establish a municipal telephone system. An executive committee was appointed to finance and solicit subscriptions for the municipal service. Address the city clerk for information.

STONE HILLS, N. Y.—The Stone Hills Telephone Company, Incorporated, has been incorporated to operate a telephone line. The capital stock is $3,000 and the incorporators are Charles Sourwine, Fred B. Mitchell and Albert G. Eiss, all of Lafargeville, N. Y.

RIO GRANDE CITY, TEX.—The Starr Telephone Company has been organized here for the purpose of establishing a line between Rio Grande City, Roma and Samfordyce. The capital stock is $5,000 and the incorporators, John Thaison, Dr. G. W. Edgerton and others.

BALLINGER, TEX.—The West Texas Telephone Company will soon begin work on extensive improvements and additions to its plant and system at Ballinger, costing about $20,000. Twelve thousand feet of new cable will be strong, a new switchboard installed and new automatic telephones put in. The work will be completed by March 1. D.

ELECTRIC RAILWAYS.

(Special Correspondence.)

MILTON, FLA.—H. S. Laird and others are planning to build a street railway to connect Milton and Bagdad, Fla.

LOUISVILLE, KY.—Interurban Railroad Company is considering the construction of an underpass near Anchorage, Ky. T. J. Minary is president. G.

NELSON, B. C.—This city recently voted to purchase the Nelson Street Railway system for approximately $46,000. Extensive improvements are planned. O.

SACRAMENTO, CAL.—The Sacramento Electric Railroad Company has been authorized by the Railroad Commission to construct the first unit of its electric railway here. C. L. Donohoe is president.

ISMAY, MONT.—The Ismay, Ekalaka & Southern Electric Railway Company will commence work in the spring for the construction of an electric railway to connect Ismay and Ekalaka. George Burke is interested.

BILLINGS, MONT.—The Big Horn Canon Irrigation & Power Company has completed a survey for a railroad 68 miles long from the Canon to Custer. Power will be developed from a dam the company is expected to build in the Big Horn Canon. C.

SAN DIEGO, CAL.—The Railroad Commission has directed the La Jolla Railway Company to electrify its line and have electric cars running between San Diego and La Jolla within a year. The cost of the work is estimated at $200,000.

RED WING, MINN.—The Commercial Club has started a movement for a street car line. The first move will be to induce St. Paul and Southern Electric Railway to build its first line to this place and Lake City. R. H. Boxrud and E. H. Foot were appointed a committee to investigate the proposition. C.

CARLYLE, MONT.—J. A. Cox, representing eastern capital, addressed a farmers' meeting about a proposed electric road from Beach, N. D., to Baker, Mont. Farmers may decide to build the line themselves and a committee was appointed to look up the proposition. James Anderson, Carlyle, is chairman. C.

MADISONVILLE, KY.—The Madisonville & Nortonville Light, Power & Traction Company, which has been incorporated under the laws of Delaware, will in all probability build an interurban line from this city to Nortonville. The company has asked the city for a franchise which will permit of the selling of electricity for power, heating and manufacturing purposes.

UNION STAR, MO.—Farmers in the community seven miles southeast of here have started a movement for an electric line which is to run from Pattonsburg to St. Joseph, a distance of about 50 miles. This road is to run through rich farming communities now from five to ten miles from any railroad. The farmers believe that there is need for the road and that the people would support it.

NASHVILLE, TENN.—The Tennessee & Kentucky Railroad Company has filed amended articles of incorporation changing its name to the Tennessee & Kentucky Interurban Railroad Company, and increasing its capitalization from $10,000 to $15,000. The company will build an interurban line to Adairville from Nashville, and branch lines to Springfield and Franklin, Ky. J. P. Helms, J. L. Weakley and others are interested.

BREMERTON, WASH. — Gustav Rust, and associates of Seattle, on January 6, were granted a franchise by the City Council to construct and operate a street car line in this city. The promotors propose to connect Hood Canal points and this city by an electric line. The erection of a $350,000 power plant on the Hama Hama River, which will have a capacity of 10,000 horsepower, is also contemplated. O.

PRINEVILLE, ORE. — Prominent business men and farmers living in this vicinity, headed by T. M. Baldwin, a local banker, have subscribed $60,000, which will be used in constructing an electric railway between this city and Metolius. Practically all of the right of way has been secured. This is an entirely different proposition from the one being promoted by H. P. Scheel, of Tenino, recently mentioned in the columns of this journal.

NASHVILLE, TENN.—The Nashville & Detroit Construction Company, which will build the line of the new Nashville, Tenn., Traction Company, has increased its capital stock from $500,000 to $1,500,000, and will start work in the near future. It will build a power plant in Eastern Kentucky, build a transmission line 80 miles long to Nashville, and will construct the trackage and other facilities needed for the operation of the line.

SAN FRANCISCO, CAL.—A new electric railroad, to operate between this city, San Jose and Monterey by way of Watsonville, will soon be incorporated, according to Attorney Charles L. Brown, one of the directors. The concern is to be known as the San Francisco Peninsula Railway Company. It is stated that the new line will build 100 miles of track, part double-tracked, with shops and headquarters in this city. Eastern and foreign capital is behind it. Thirty miles of the right of way have already been deeded and survey for the whole is nearly complete; the San Jose franchise was obtained a year ago by private parties, and the Watsonville franchise also has been obtained.

PROPOSALS.

ELECTRIC ELEVATOR.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until January 30 for the installation complete of an electric passenger elevator in the post office at Vicksburg, Miss.; also one in the post office at Minneapolis, Minn., in accordance with drawings and specifications, copies of which may be obtained from the office of the Supervising Architect.

NONINTERFERING LOCAL FIRE-ALARM SYSTEM.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until February 13 for a noninterfering local fire-alarm system in the Appraisers' Warehouse, New York City, in accordance with specifications, copies of which may be obtained from the Supervising Engineer, New York City, or the office of the Supervising Architect.

INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until February 11 for the interior lighting fixtures of the post office at Boonville, Mo.; and until February 20 for the same for the post office at Atlanta, Ga. Drawings and specifications may be obtained from the custodians of the sites or from the office of the Supervising Architect.

ELECTRICAL FITTINGS.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until January 27 for 40-pair lead-sheathed telephone cable, for delivery at the Navy Yard, Brooklyn, N. Y., as per Schedule 6236; until February 4 for two sets storage batteries for use in electric trucks, for delivery at the Navy Yard, Mare Island, Cal., and 8,200 dry cells, for delivery at various navy yards, as per Schedule 6228; until February 17 for furnishing three five-kilowatt radio sets for shore installation, for delivery at the Navy Yard, Brooklyn, N. Y., as per Schedule 6246. The Bureau will also receive bids until February 10 for miscellaneous voltmeters, ammeters and wattmeters for delivery at the Navy Yard, Mare Island, Cal., as per Schedule 6258.

NEW PUBLICATIONS.

HIGH-FREQUENCY AMMETERS.—The Bureau of Standards, Washington, D. C., has published Technical Paper No. 206, entitled "High-Frequency Ammeters," by J. H. Dellinger. An abstract of this paper was given in our issue of October 18, 1913.

INDUSTRIAL RESEARCH. — The presidential address before the American Chemical Society at the 1913 convention by Arthur D. Little, entitled "Industrial Research in America," has been reprinted for distribution by Arthur D. Little, Incorporated, 93 Broad Street, Boston, Mass.

NEW YORK COMMISSION REPORT.—The New York Public Service Commission for the First District has published Vol. I of its annual report for 1912. This is concerned largely with transportation matters in New York City. The testing of gas and electric meters and other matters connected with the regulation of gas and electric corporations in the city are included.

ELECTROLYTIC CORROSION.—The Bureau of Standards, Washington, D. C., has published Technologic Paper No. 25, entitled "Electrolytic Corrosion of Iron in Soils," by Burton McCollum and K. H. Logan. This consists of a paper which was presented before the American Institute of Electrical Engineers at the last annual convention. An abstract of it will be found in our issue of July 5, 1913.

JOURNAL OF MECHANICAL ENGINEERS.—The American Society of Mechanical Engineers has, with the January issue, changed the form of its *Journal*, which will hereafter include the transactions, the separate publication of which is discontinued. The page size of the *Journal* will hereafter be 9 by 12 inches. Papers will not hereafter be published in the *Journal* in advance of meetings, but will be available in advance in pamphlet form.

PUBLIC SERVICE LIBRARY CATALOG.—A catalog of the Library of the Public Service Corporation of New Jersey, located in the Public Service Building, Newark, N. J., has been prepared by the librarian, Mrs. Helen I. Brewer, and printed. Books are listed according to author and title, alphabetically. The catalog comprises 152 pages and contains only the books to be found in the general library of the company and not the collections in the various departments. This list is to be followed by a classified catalog.

FINANCIAL NOTES

The Minnesota Gas & Electric Company has sold to Chicago bankers $325,000 of its first-mortgage six-per-cent bonds, which are being offered at par and accrued interest. The bonds are dated August 1, 1913, and due August 1, 1933.

The United Light & Railways Company has sold to the Continental & Commercial Savings Bank, N. W. Halsey & Company and Russell, Brewster & Company, all of Chicago, $500,000 of its first and refunding five-per-cent 20-year bonds, due June 1, 1932. Bonds are being offered at 86 to yield 6.25 per cent and are redeemable at 102.5 and interest on any interest date, on sixty days' notice.

Control of the Bristol & Plainville Tramway Company has formerly passed to Richter & Company, of Hartford, Conn., and Charles H. Tenney, of Springfield, has been elected chairman of the board; A. B. Tenney, president; D. Edgar Manson, of New Haven, vice-president, and Morris L. Tiffany, of Bristol, secretary and treasurer. Other directors are John T. Trumbull, Rollin J. Plumb, Robert F. Briggs, Nobel E. Pierce, W. H. Putnam, and Ferdinand Richter.

The Omaha & Council Bluffs Street Railway Company on May 1 will redeem the $1,846,000 outstanding bonds of the Omaha Street Railway Company by an issue of $2,000,000 first-consolidated 5s, due January 1, 1928. This new issue has been purchased by A. B. Leach & Company of New York City, and is being offered at 97 and interest. The holders of the Omaha Street Railway bonds have the option to exchange their holdings for the new Council Bluffs consolidated 5s.

The Michigan State Railroad Commission has granted permission to the Detroit Edison Company to increase its capital stock from $15,000,000 to $25,000,000 and to issue and sell $3,400,000 (par value) six-per-cent debenture bonds, against which will be held the remaining $1,350,000 of the present $15,000,000 authorized capital stock and $2,050,000 of the increase in capital stock. Alexander Dow, general manager of the Detroit Company, stated that at least $3,000,000 is to be spent in Detroit improvements.

From the revenue derived from the investment of the Montreal Telegraph Company's contingent fund the twelfth annual bonus amounting to $5,000 was declared at the sixty-seventh annual meeting. Quarterly dividends amounting to $160,000 were paid, this being at the rate of eight per cent. The report shows the property of the company valued at $2,151,823. It is operated and maintained by the Great Northwestern Telegraph Company of Canada, its operation and maintenance being also guaranteed by the Western Union Telegraph Company.

Directors of the Consolidated Gas, Electric Light & Power Company of Baltimore, have formerly authorized an increase of $1,416,000 of the common stock of the company. When this stock is issued the common will total $9,216,000, which, with $6,360,000 preferred, will increase the stock outstanding to $15,576,086. The new stock will be first offered to present stockholders at par, and they will have the privilege of subscribing for one share for each ten they now hold. Stock not taken by present stockholders will be underwritten by a syndicate.

The Kuhn interests, of Pittsburgh, have consolidated 162 electrical companies in Western Pennsylvania into four companies. The new companies are the West Penn Light & Power Company, with a capital of $244,000, and composed of 39 companies; the West Penn Lighting Company, formed of 100 companies and with capital stock of $547,000; The West Penn Electric Company, made up of 16 companies, capital $901,000, and the Kittanning Electric Company, formed of seven companies with a capital of $51,000. The directors of each company are the same, as follows: W. S. Kuhn, I. B. Van Wagener, Byron Trimble, J. A. Lynch and C. W. Scheieck. Another consolidation was the combining of 26 companies chartered for the Ohio and the Beaver valleys into the Harmony Electric Company, with a combined capital of $130,000. The directors are William McBride, Sewickley; D. C. Wiseman, Bellevue; Harrison Bock, Sharpsburg; L. T. Bedell, McKeesport and C. H. Walsh, Pittsburgh.

Dividends.

American Light & Traction Company; regular quarterly of 1.5 per cent on preferred and 2.5 per cent in cash and 2½ per cent in common stock on common, both payable February 2.

Associated Gas Electric Corporation; regular quarterly of 1.5 per cent on preferred, payable January 15 to stock of record December 3.

Brooklyn City Railroad Company; regular quarterly of two per cent, payable January 15 to stock of record January 6.

Columbus Railway Company; the regular quarterly dividend of 1.25 per cent on the preferred stock, payable February 2 to stock of record January 15.

Kaministiquia Power Company, Limited; quarterly of 1.5 per cent, an increase of one-quarter of one per cent over previous declaration.

Manhattan Electric Supply Company; the regular semi-annual dividend of three per cent on the preferred and three per cent on the common stock, payable February 2 to stock of record January 18.

Montreal Tramways Company; quarterly of 2.5 per cent, payable February 2 to stock of record January 15.

New Hampshire Electric Railways; regular semi-annual of two per cent on preferred stock, payable January 31.

Public Service Investment Company; semi-annual of $1.50 on preferred stock and $2 on common, payable February 2 to stock of record January 15.

Railways Company, General; regular quarterly of one per cent, payable February 1.

Rio de Janeiro Tramway, Light & Power Company; quarterly of 0.25 per cent, payable Februarv 2 to stock of record January 15.

United Traction Company, of Pittsburgh; semi-annual of 2.5 per cent on preferred stock, payable January 20 to stock of record January 10.

West Pennsylvania Traction Company; regular quarterly of 1.5 per cent on preferred, payable January 15 to stock of record January 13.

Reports of Earnings.

LONDON UNDERGROUND (METROPOLITAN DISTRICT):

	1913	1912
Week end. Dec. 20	£ 13,282	£ 13,167
Jan. 1-Dec. 20	663,042	644,657
London Underground (London Electric Railway):		
Week end. Dec. 20	£ 14,725	£ 14,975
Jan. 1-Dec. 20	697,815	697,165
London Underground (London General Bus):		
Week end. Dec. 20	£ 61,528	£ 60,393
Jan. 1-Dec. 20	3,150,312	2,636,800

UNITED LIGHT & RAILWAYS.

Subsidiary companies:	1913	1912
November gross	$ 527,130	$ 479,026
Net after taxes	204,736	204,975
Surplus after charges	100,151	109,479
Twelve months' gross	5,999,052	5,260,105
Net after taxes	2,421,941	2,161,941
Surplus after charges	1,216,257	1,050,262
Holding companies:		
November gross	131,217	108,764
Net after expenses and charges	91,178	73,948
Balance after preferred division	47,959	41,293
Twelve months' gross	1,136,511	.....
Net after expenses and charges	989,233	.....
Balance after preferred division	478,535	.....

OMAHA & COUNCIL BLUFFS STREET RAILWAY.

The Omaha & Council Bluffs Street Railway reports for the year ended December 31, 1913, as follows:

	1913	1912
*Gross earnings	$2,955,727	$2,852,963
Operating expenses and taxes	1,564,542	1,479,686
Net earnings	1,431,185	1,373,277
Interest charges	601,755	591,940
Balance	829,430	781,337
Depreciation	240,000	240,000
Balance applicable for division	589,430	541,337

*December estimated.

NEW YORK RAILWAYS.

New York Railways Company reports earnings for the month of November and five months as follows:

	1913	1912
November gross	$ 1,138,477	$ 1,154,417
Net after taxes	328,077	342,659
Other income	36,628	44,924
Total income	364,706	387,583
Surplus after charges	87,544	108,668
Passengers carried	22,502,895	22,439,804
Five months' gross	5,977,220	5,897,085
Net after taxes	1,818,350	1,799,708
Other income	159,089	183,210
Total income	1,977,439	1,982,919
Surplus after charges	592,775	587,668

Operating expenses include reserves imposed upon the company by order of the Public Service Commission, now in litigation.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Jan. 12.	Jan. 5.
American Tel. & Tel. (New York)	119	118½
Commonwealth Edison (Chicago)	132	133
Edison Electric Illuminating (Boston)	247	245
Electric Storage Battery common (Philadelphia)	48¼	47
Electric Storage Battery preferred (Philadelphia)	48¼	47
General Electric (New York)	140½	140⅜
Kings County Electric (New York)	119	119
Manhattan Transit (New York)	1⅛	1⅛
Massachusetts Electric common (Boston)	12	12
Massachusetts Electric preferred (Boston)	63	63½
National Carbon common (Chicago)	135	132
National Carbon preferred (Chicago)	116	115
New England Telephone (Boston)	135½	133
Philadelphia Electric (Philadelphia)	26¾	26
Postal Telegraph and Cables common (New York)	76	75
Postal Telegraph and Cables preferred (New York)	65¼	65
Western Union (New York)	58½	59¾
Westinghouse common (New York)	66	64½
Westinghouse preferred (New York)	116	114½

ATLANTIC GAS & ELECTRIC.

Year ended Oct. 31:	1913	1912
Cons. inc. of sub properties	$1,128,132	$1,021,869
Net sur. from sub. prop. for Atlan. Gas & Electric	185,798	198,462
Other income	73,360	69,165
Gross income	259,158	267,627
Net income after expiration	248,846	239,181
Surplus after charges.	148,846	139,181
Balance after preferred dividends	43,846	34,181

TWIN CITY LINES.

	1913	1912
November gross	$ 751,113	$ 700,676
Net	376,166	352,791
Surplus after charges.	227,841	199,217
Eleven months gross..	8,085,035	7,485,814
Net	3,998,715	3,689,157
Surplus after charges	2,378,951	2,107,791

BALTIMORE COUNTY WATER & ELECTRIC.

Baltimore County Water & Electric Company reports for the year ended October 31, 1913.

	1913	1912
Gross earnings	$266,623	$232,082
Net after taxes	126,676	100,094
Surplus after charges	79,026	.....

LEHIGH VALLEY TRANSIT.

	1913	1912
November gross	$ 191,199	$ 184,851
Net	133,337	131,048
Surplus after charges.	62,598	85,766
Twelve months gross..	1,764,997	1,526,776
Net	1,024,716	876,697
Surplus after charges.	446,572	374,442

AMERICAN GAS & ELECTRIC.

Six subsidiaries of the American Gas & Electric Company report for the twelve months ended November 30 as follows:

CANTON ELECTRIC.

	1913.	1912.
Gross earnings	$407,728	$344,115
Net after taxes	204,617	171,933
Surplus after charges	143,953	115,092

MARION LIGHT & HEATING.

Gross earnings	$252,196	$223,054
Net after taxes	116,208	87,320
Surplus after charges	70,696	48,513

MUNCIE ELECTRIC LIGHT.

Gross earnings	$452,325	$381,928
Net after taxes	188,774	165,035
Surplus after charges	101,305	86,812

ROCKFORD ELECTRIC.

Gross earnings	$457,796	$413,793
Net after taxes	239,046	199,906
Surplus after charges	142,973	105,662

SCRANTON ELECTRIC.

Gross earnings	$910,013	$798,172
Net after taxes	558,424	444,001
Surplus after charges	363,172	294,523

WHEELING ELECTRIC.

Gross earnings	$308,018	$256,528
Net after taxes	146,455	119,545
Surplus after charges	79,772	63,508

NORTHERN TEXAS ELECTRIC.

	1913	1912
November gross	$ 197,719	$ 169,150
Net after taxes	88,682	84,088
Surplus after charges.	64,630	59,426
Twelve months gross..	2,118,257	1,762,985
Net after taxes	951,129	834,625
Surplus after charges.	663,602	572,888

PACIFIC LIGHT & POWER CORPORATION.

	1913	1912
November gross	$ 234,155	$ 224,140
Net	112,564	87,573
Surplus after charges..	66,931	49,520
Twelve months' gross..	2,853,239	2,509,239
Net	1,291,551	1,081,997
Surplus after charges..	812,633	590,449

CHICAGO & MILWAUKEE ELECTRIC RAILWAY.

The receiver for the Chicago & Milwaukee Electric Railway Company for the 10 months ended October 31, 1913, reports as follows:

	1913	1912
Gross revenue	$802,472	$818,200
Gross income	310,631	333,429
Taxes	44,166	42,500
Inter on obligations of receiver	52,019	54,894
Total deductions	96,187	97,394
Net income	214,444	234,034

The net income for the year ending December 31, 1913, will be sufficient to pay the interest on the $1,080,000 first-mortgage bonds due January 14 and leave about two per cent on the $5,000,000 of Illinois division bonds.

REPUBLIC RAILWAY & LIGHT.

	1913	1912
November gross	$ 251,259	$ 233,970
Net after taxes	100,246	100,014
Surplus after charges.	56,728	56,352
12 months gross	2,979,608	2,638,427
Net after taxes	1,162,160	1,059,870

ILLINOIS TRACTION COMPANY.

	1913	1912
October gross	$ 729,532	$ 689,193
Net after taxes	325,791	315,962
Ten months gross	6,458,095	6,105,335
Net after taxes	2,621,554	2,438,283

YOUNGSTOWN & OHIO RIVER RAILROAD.

	1913	1912
November gross	$ 21,547	$ 20,039
Net after taxes	8,038	7,920
Surplus after charges	3,869	3,753
Five months gross	116,032	109,248
Net after taxes	44,725	43,272
Surplus after charges	23,892	22,439

PUGET SOUND TRACTION, LIGHT & POWER.

	1913	1912
October gross	$ 744,519	$715,378
Net after taxes	325,034	218,564
Surplus after charges..	150,566	149,199
Twelve months gross..	8,506,260	.....
Net after taxes	3,553,612	.....
Surplus after charges..	1,497,166	.....

SOUTHERN CALIFORNIA EDISON.

	1913	1912
November gross	$ 391,822	$ 366,602
Gross income	181,391	174,832
Surplus after charges.	106,162	113,676
Balance after depreciation	41,162	53,676
Eleven months gross..	4,330,935	3,914,469
Gross income	2,161,646	1,810,161
Surplus after charges.	1,381,847	1,150,663
Balance after depreciation	746,847	605,663

GALVESTON-HOUSTON ELECTRIC.

	913	1912
November gross	$ 211,612	$ 181,074
Net after taxes	89,483	76,288
Surplus after charges.	52,918	42,566
Twelve months gross..	2,352,895	1,981,369
Net after taxes	1,007,663	821,718
Surplus after charges.	589,276	429,707

DALLAS ELECTRIC.

	1913	1912
November gross	$ 198,259	$ 163,751
Net after taxes	82,224	72,534
Surplus after charges.	55,522	47,899
Twelve months gross..	2,163,823	1,800,248
Net after taxes	903,224	710,779
Surplus after charges.	602,289	425,501

PERSONAL MENTION.

MR. F. X. CLEARY, district manager at New York for the George Cutter Company, has returned recently from a visit to the company's plant at South Bend, Ind.

MR. HARRY H. WELLS, district manager of the Public Service Electric Company at Orange, N. J., has been appointed divisional agent of Essex County for the company.

MR. D. WALKER WEAR, formerly purchaser of the Chicago Tunnel Company, has been elected vice-president and director of the Stow Manufacturing Company, with offices at 443 State Street, Binghamton, N. Y.

MR. ERNEST RITTER, formerly manager for the Bell Telephone Company at Allentown, Pa., has been appointed district manager for the company of all territory between Monongahelia, Pa., and Clarksburg, W. Va.

MR. H. B. STABLER, equipment engineer of the Chesapeake & Potomac Telephone Company, has an article in the monthly journal published by the Engineers' Club of Baltimore entitled "Some Notes on Telephone Engineering."

MR. W. J. RUSH has been appointed western sales representative of the Best Electric Company, Pittsburgh, Pa. Mr. Rush will be located in Chicago, and will look after the sales of the company for the western, northern and southern states.

MR. GEORGE F. MADDOCK has been appointed manager of the Examinations and Reports Department of H. M. Byllesby & Company. Mr. Maddock, who succeeds MR. HAROLD ALMERT, resigned, has been the representative of Byllesby & Company on the Pacific Coast for a number of years, residing at Berkeley, Cal.

MR. W. R. HAYNIE has been appointed United States representative of the Consolidated Diesel Engine Manufacturers, Limited, of Aldwych, London, England, with offices at 30 Church Street, New York. Mr. Haynie is also United States representative of the above company's associates, Messrs. Carels Freres & Diesel Engine Company, Limited, of Ghent, Belgium.

MR. W. J. MARLAND, Oakland, Cal., is making a trip throughout the country arranging for a collective exhibit of electrical and mechanical devices at the Panama-Pacific Exposition. It will be remembered that Mr. Marland conducted a collective exhibit of electrical specialties at the Pan-American Exposition at Buffalo in 1901. Mr. Marland states that he has arranged to represent a large number of leading electrical manufacturers. The plant is to show a working demonstration of various electrical and mechanical specialties grouped together in operating units. Expert demonstrators and linguists will be provided to answer all questions and establish complete representation for the manufacturers who participate in this enterprise.

MR. W. R. GARTON has resigned as vice-president and general manager of the Lord Manufacturing Company, Brooklyn. Mr. Garton is well known to the electrical industry, having been active in the field for many years. He was one of the pioneers in the construction of telephone, electric light and railway properties, and more recently has devoted a great deal of time to the supply and manufacturing business. He is an associate member of the American Institute of Electrical Engineers, and a member of the American Electrical Railway Association, the New York Railway Club, the Keystone Electric Railway Club, the New England Street Railway Club, and the New York Electric Railway Association. His temporary address will be 851 East Nineteenth Street, Brooklyn.

OBITUARY.

MR. GEORGE F. REED, general manager of the Springfield Street Railway, died of heart failure at his home in Springfield, Mass., on January 18. Mr. Reed was 47 years of age and had been in the employ of the company for 32 years.

MR. HERMAN CHARLES MEINHOLTZ, of the Heine Safety Boiler Company, St. Louis, Mo., died in that city December 24, 1913, at the age of 45. Mr. Meinholtz had been with the Heine Company since he was 19 years old and at the time of his death was in direct supervision of the company's factory. He was a member of the Engineers' Club of St. Louis and of the American Society of Mechanical Engineers. He is survived by his widow and five children.

NEW INCORPORATIONS.

MEADOWVIEW, VA.—Edmondson Electric Company has been incorporated with a capitalization of $5,000. D. H. Edmondson is president, and S. W. Edmondson, secretary.

PERTH AMBOY, N. J.—Guth Electrical Company has been incorporated with a capital stock of $50,000. The incorporators are M. J. Dahl, A. Guth, and D. Guth, all of this city.

NEW YORK, N. Y.—Manhattan Brass & Electrical Company, Incorporated, has been incorporated with a capital stock of $14,000 by Harry Hilfman, Samuel Denemark, New York City; and Henry Denemark, Brooklyn.

CHICAGO, ILL.—The Consumers' Light & Power Company has been incorporated with a capital stock of $10,000 to do a general electricity, power, steam, light and heat business. The incorporators are Charles Kiper, Jerome N. Frank and Harvey R. Willard, of Chicago. Z.

CHICAGO, ILL.—The Electric Construction Company has been incorporated with a capital stock of $10,000 to engage in electrical contracting and manufacturing. The incorporators are Christopher C. Buckles, George Homer Hightower and Ernst W. Cooley. Z.

SCRANTON, PA.—Charters have been issued to the Commercial Electric Company, of Olyphant, and the Republic Electric Company, of Blakely, each with a capital stock of $5,000 and offices in this city. The incorporators are C. H. Perrigo, J. A. Gibbons and J. B. Neville, all of Scranton.

DATES AHEAD.

Efficiency Society. Annual convention. New York, N. Y., January 26-27.

Western Association of Electrical Inspectors. Annual meeting, Cincinnati, O., January 27-30.

Northwestern Cedarmen's Association. Annual convention, Escanaba, Mich., January 27-28.

American Electric Railway Association. Mid-year meeting. Engineering Societies Building, New York, N. Y., January 29-31.

Wisconsin State Telephone Association. Madison, Wis., February 11-12.

American Institute of Mining Engineers. Annual convention, New York, N. Y., February 17-20.

American Institute of Electrical Engineers. Annual mid-winter convention, Engineering Societies Building, New York, N. Y., February 25-27.

State Independent Telephone Association. Des Moines, Iowa, March 10-12.

Telegraphers' Mutual Benefit Association. New York, N. Y., March 11.

Peoria Electric Show. Peoria, Ill., March 9-15.

Buffalo Electrical Show. Elmwood Music Hall, Buffalo, N. Y., March 9-16.

American Railway Engineering Association. Annual convention. Chicago, Ill., March 17-20.

American Electrochemical Society. Twenty-fifth general meeting, New York, N. Y., April 16-18.

Electrical Contractors' Association of Texas. Annual convention, April 25, 1914.

With the Electrical Manufacturers

Charles Cooper & Company, 194 Worth Street, New York, N. Y., has sent out its usual monthly price list of chemicals which it has either imported or itself manufactured. This list is growing from month to month and contains many interesting prices of a great number of chemicals used in various arts.

The Samson Cordage Works, Boston, Mass., is distributing to the trade a handsome calendar and pad for either a roll-top or flat-top desk. This calendar is not only of a very practical size, but is a matter of considerable ornament. The pad is made up of a pebbled dark gray mat, embossed in white, showing the Samson medallion in relief.

Pawling & Harnischfeger Company, Milwaukee, Wis., has recently issued bulletin No. 401, which is devoted to its type H electric traveling cranes. This publication contains detailed descriptions of the principal parts of these cranes and has over 20 illustrations thereof. Either direct-current or alternating-current motors are provided and a variety of safety devices are included.

Bridgeport Brass Company, Bridgeport, Conn., is sending out circular letters to electric railway lines urging them to consider the merits of Phono-Electric trolley wire in making up this year's specifications for trolley wire. The manufacturers say that this wire gives from two to three times the life and service that hard-drawn copper wire does under similar working conditions.

Frank W. Morse, 516 Atlantic Avenue, Boston, Mass., in a recent price list, gives brief illustrated descriptions of a large assortment of automobile and motor-boat electric-lighting appliances. These are made in a variety of forms suitable for many standard and special services. Included in the assortment are search lamps, trouble lamps, boat and carriage lamps, dash lamps, lamp adapters, special sockets for vehicle and boat use, connectors of various types, combination sockets and connectors, switches, flexible connections, etc.

The Cutter Electrical & Manufacturing Company, Philadelphia, Pa., manufacturer of I-T-E circuit-breakers, announces the opening of a new branch office in Indianapolis, Ind., under the direction of Linn O. Morrow, whose territory will include southern Indiana and Illinois, Kentucky, Tennessee and Missouri. Mr. Morrow has been connected with the Cutter Company for over six years, having spent about four years in the engineering department. The Indianapolis office will be under the supervision of H. F. Darby, Jr., Chicago district manager.

General Insulate Company, 1008 to 1014 Atlantic Avenue, Brooklyn, N. Y., the well-known manufacturer of Insulate composition, reports that, despite the general quietness prevailing in nearly all trades during the latter part of 1913, the year, as a whole, has been the most successful one which the company has ever enjoyed, the business for the year showing an increase of nearly 40 per cent over that of any previous year. Mr. Steinberger, the genial president of General Insulate Company, reports that the indications for 1914 are most promising, business already contracted for being even in greater volume than in the early part of 1913.

American District Steam Company, North Tonawanda, N. Y., is sending out to patrons and friends a beautiful, large calendar for 1914. Its outside dimensions are 21.5 by 46 inches. On it is reproduced the famous painting by DeLand depicting with historical fidelity and great beauty of color the first inauguration of George Washington as President of the United States, which took place on the portico of Federal Hall in New York City, April 30, 1789. The reproduction is 16 by 20 inches in size, surrounded by an attractive border bearing the legend of the American District Steam Company, which has been in the business of engineering, manufacturing and installing central steam-heating equipment continually since 1877.

H. W. Johns-Manville Company, New York, N. Y., has issued an illustrated booklet describing in detail the working of the Audiffren-Singrun automatic refrigerating machine. This points out the many advantages of this ingenious aparatus, among which is the hygenic principle on which it operates so effectively. It also points out that with the constantly recurring shortage of natural ice, which this summer will be more noticed than ever before, there is need for a means of obtaining artificial refrigeration conveniently and effectively. The company reports that among the many orders received for these equipments is one for the complete equipment of the Bellevue Apartments at Madison, Wis. Installations are being made daily in residences, clubs, hotels, cafes, butcher shops, dairies, etc.

The National India Rubber Company, Bristol, R. I., has published a very handsome catalog illustrating and describing its complete line of rubber-covered insulated and lead-incased wires and cables. This is without doubt one of the handsomest catalogs that has been produced devoted to any material in some time. It con-

tains 224 pages and is printed on beautiful coated paper. The text is printed in black and the illustrations are in silver, bronze and colors, showing the actual appearance of the lead sheath, the copper conductor and insulating cover. In addition to the information respecting the products manufactured by the company, a large portion of the catalog is devoted to a study of specifications for double-braided, weatherproof, hard-drawn copper wire; specifications for mineral matter, rubber compound insulated signal wire for 660 volts or less; specifications for aerial braided cable for 660 volts or less; specifications for rubber-insulated, armored submarine cable for 660 volts or less; specifications for armored submarine cables for 2,200 volts; specifications for lead-covered cable for 660 volts or less; specifications for lead-covered cables for 2,200 volts, specifications for underground braided cables for 660 volts or less; extracts from the rules and requirements of the National Board of Fire Underwriters with respect to insulated wires; copper wire tables, diameters of wires in strands, approximate equivalent cross sections of wires, weight per 2,000 feet of bare copper wire in pounds, carrying capacities of insulated wires and cables, definitions of electrical units, wiring formulas and other essential engineering data.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., advises us that during the past year it has undertaken a number of contracts for hydroelectric development in Alaska that will do much to improve mining conditions in that territory. The most important of these is the new generating unit for the Alaska Treadwell Gold Mining Company to be installed in the Hugget Creek development. This unit will consist of a 2,350-kilowatt water-wheel generator driven by a Pelton water wheel running at 300 revolutions per minute. A 50-kilowatt motor-generator exciter set, with special shaft so that the unit may be water-wheel driven when desired, is also included. A contract has been recently closed for a 300-kilowatt water-wheel generator to be installed by the Chichagoff Mining Company operating near Sitka. This will supplement the company's present installation of 127.5 kilowatts. With the generator there were also ordered the necessary transformers for transmitting the energy at high voltage from the power plant to the mines. During the summer the Kennecott Mines Company, operating one of the highest grade copper mines in the world, located in the Copper River district, purchased a 200-kilowatt water-wheel generator, together with all the necessary switchboard and accessories. This water-power plant will supplement a steam-driven power plant now being operated by the mining company and containing one 400 and one 50-kilowatt generator. A considerable number of electric motors for mining and milling operations were purchased with the above generators. In addition to the above, the Alaska Juneau Gold Mining Company of Juneau, Alaska, recently purchased from the Westinghouse company a 1,000-kilowatt water-wheel generator to be driven by a Pelton wheel, the energy from which will be used to supplement that of a 937-kilowatt steam turbine.

Record of Electrical Patents.

Issued by the United States Patent Office, January 6, 1914.

1,083,285. Electrical Ignition System for Internal-Combustion Engines. F. Kratz, assignor to firm of Robert Bosch, Stuttgart, Germany. A special arrangement for starting the ignition from a battery.

1,083,306. Electric Signaling System. J. D. Taylor, assignor to Union Switch & Signal Co., Swissvale, Pa. The impedance of the track rails at the block ends is increased by laminated-iron plates adjacent to the web of the rails.

1,083,315 Automatic Stopping Device. W. H. Yetman, assignor to Samuel L. Moore & Sons Corporation, Elizabeth, N. J. Electromagnetically operated check-valve drain and engine stop, actuated when a tank has been pumped full.

1,083,317. Treatment of Peat and the Like. E. A. Buckle, assignor to International Nitrogen & Power Co., Ltd., London, England. Water is extracted by passing current through the peat heated to a temperature of over 100 degrees C. under pressure so that no steam is produced.

1,083,325 and 1,083,326. Incandescent Lamp. S. O. Hoffman, San Francisco, Cal. In combination with the filament is an arrangement of lenticular prisms to produce spectrum images of the source and means whereby the luminous radiation is allowed to radiate freely and the infra-red radiation is directed back to the source to be converted into light.

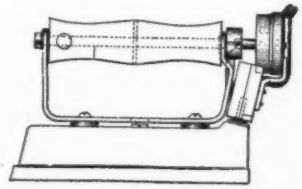
1,083,331. Incandescent Electric Lamp. T. W. Lowden, assignor to Acton Lamp Co., Ltd., London, England. Has a special support for the metal filament.

1,083,353. Production of Perforated Strips. T. A. Edison, assignor to Edison Storage Battery Co., West Orange, N. J. A machine for continuously feeding a battery-element strip of perforated material past a grinder to reduce the burrs surrounding the perforations.

1,083,354. Insulating Compound. T. A. Edison, Orange, N. J. Contains tetracholoronaphthalene and asphalt.

1,083,355. Art of Forming Chemical Compounds. T. A. Edison. The process of forming nickel hydroxide for use in alkaline storage batteries consists in mixing a dry pulverized crystallized salt of nickel and an excess of dry soluble hydroxide, drying the mass, crushing and washing, and finally drying the residue.

1,083,356. Storage Battery. T. A. Edison, assignor to Edison Storage Battery Co. The active material for the positive electrodes of alkaline storage batteries consists of nickel hydroxide containing not more than 5 per cent cobalt hydroxide.



1,083,534.—Flatiron with Rotary-Handle Snap Switch.

1,083,370. Device for Maintaining the Equilibrium of a Pendulum. W. Luyken, assignor to Fried. Krupp Aktiengesellschaft, Essen-on-the-Ruhr, Germany. Includes two electrically controlled disk systems and two auxiliary pendulums mounted on the main pendulum.

1,083,375. Electrical Foot-Warmer. T. Plimley, Victoria, B. C., Can. Electrically heated boot-black stand.

1,083,386. Electrically Heated Instrument. J. A. Chapman, Fort Worth, Tex. One blade of a scissors has an exposed resistance wire.

1,083,406. Telephone Desk Set. H. L. Knight and B. W. Sweet, assignors to Century Telephone Construction Co., Buffalo, N. Y. Relates to details of the tubular standard and of the base.

1,083,412. Electric Hoist. H. B. Shreve, assignor to Weir & Craig Mfg. Co., Chicago, Ill. A portable hoist with the winch drum and motor inclosed in a common casing, and a double-pull-chain controller.

1,083,418. Contact-Holder. A. Sundh, assignor to Otis Elevator Co., Jersey City, N. J. An electric elevator switch has a spirally fluted contact block and a similar holder therefor.

1,083,431. Automatic Switch for Trolley Roads. R. V. Cheatham, St. Matthews, Ky. A double solenoid controlled by the motor current of a car actuates the switch.

1,083,448. Fitting Submarine Signaling Apparatus in Vessels. S. Lake, assignor to Lake Torpedo Boat Co., Bridgeport, Conn. Has electrical means for operating a striker in a resonant compartment of a submarine boat.

1,083,456. Translating and Selecting System. E. C. Molina, assignor to American Telephone & Telegraph Co. For a selective telephone system.

1,083,486. Apparatus for Producing Electric Contacts at Adjustable Periodic Intervals. L. A. Granoux, Marseille, France. Electromagnets cause a change in the direction of movement of the contact lever and an index arm determines the length of the oscillating period.

1,083,498. Synchronizing Picture-Exhibiting and Sound-Record Machine. I. Kitsee, Philadelphia, Pa., assignor to Cort-Kitsee Co. The clutch between the picture machine and its motor is electromagnetically controlled by the phonograph.

1,083,520. Portable Electric Light. C. F. Burgess, Madison, Wis. A flashlight has an adjustable resistance wound around the casing to protect the lamp from the high initial voltage of the batteries and to compensate for

deterioration in the batteries due to age.

1,083,525. Speed Control for Motor Cars. S. K. Evans, Elmsford, N. Y. A contact moving with the speedometer index is connected to the circuit-controlling device.

1,083,530. Electric Searchlamp for Automobiles. J. Gallay, Geneva, Switzerland. A plug at the rear holds the lamp, reflector and casing together.

1,083,534. Electrically Heated Flat-iron. M. I. Grimes, Winthrop, Mass. Partial rotation of the handle operates a rotary snap switch. (See cut, page 161.)

1,083,541. Perforating Device. A. Kettnich, Denver, Colo. Has electromagnetic control for the punches.

1,083,542. Switching Socket or Connector. G. C. Knauff, Chicago, Ill. A double-ended socket for an automobile lamp, one end receiving the lamp and the other a connecting plug.

1,083,557. Electrically Heated Cooking Apparatus. J. W. Phelps, Detroit, Mich. A special armor for a heating unit of an electric "fireless" cooker.

1,083,566. Relay. S. R. Stone, New York, N. Y. Has an armature at each end of the electromagnet.

1,083,569. Protector for Telephone-Transmitters. H. van Hoevenberg, North Elba, N. Y., and R. W. Pope, Elizabeth, N. J., assignors of one-half to W. J. Spain. A cap can be locked over the mouthpiece.

1,083,580. Monitor. H. C. Zenke, Richmond Hill, N. Y. An electric recording system.

1,083,588. Train-Controlling Device. J. J. Brennan, Fort Wayne, Ind. Includes a clock, an electric bell, and electromagnetic air-brake control.

1,083,592. Electrical Drying-Oven. H. J. Cary-Curr, assignor to E. H. Sargent & Co., Chicago, Ill. Electrically heated and thermostatically controlled.

1,083,638. Shaft-Speed Indicator for Cream-Separators and the Like. J. K. Stewart, assignor to Stewart-Warner Speedometer Corporation, Chicago, Ill. Of the magnetic type.

1,083,658. Electric Arc Lamp. H. H. Boney, Chicago, Ill. A special feed mechanism for a projecting lamp.

1,083,669. Electric Traffic-Controlling System. F. L. Dodgson, assignor to General Railway Signal Co., Gates, N. Y. Special relay arrangement for the track circuits.

1,083,671. Telephone Mouthpiece with Antiseptic Attachment. T. Duquette, Sr., North Grosvenor Dale, Conn. Has absorbent material in an annular flange.

1,083,677. Method of Producing High Vacuums in X-Ray Tubes and the Like. C. A. Friedrich, New York, N. Y. Consists in heating both the anode and the cathode to red heat by means of low-potential currents.

1,083,691. Process for Obtaining Aluminum. P. C. McIlhiney, Great Neck, N. Y. Consists in electrolyzing the bath with continued additions of aluminum fluoride and water to obtain metallic aluminum and hydrofluoric acid.

1,083,715. Trolley. E. Washington, Pittsburgh, Pa. Has a rearwardly extending guard trough.

1,083,717. Automatic Car-Arrester. R. A. Willson and A. L. Wright, Spokane, Wash. At each end of the car are automatic means for shutting off the control current and applying the air brakes.

1,083,726. Circuit-Breaker Connection for Electric Railway Systems. F. E. Case, assignor to General Electric Co. Connected between overlapping trolley sections having different voltages.

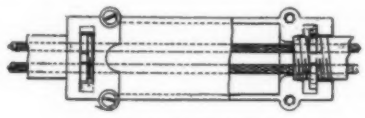
1,083,729. Dynamo-Electric Variable Gearing. F. Collischonn, assignor to General Electric Co. The engine and drive wheels of a car are connected through a generator-motor coupling, the members of which can also be mechanically connected.

1,083,730. Driving Mechanism for Motor Vehicles. F. Collischonn, assignor to General Electric Co. The engine is connected to a generator which supplies current to the driving motors; the engine can also be directly connected to the motors through differential gearing.

1,083,755. Insulating Material and Process of Making the Same. J. C. Peabody, assignor to Republic Mfg. Co., Boston, Mass. Consists of paper fiber and uncombined resin distributed uniformly over the surface of the fibers, the whole being rendered dense and homogeneous by heat and pressure.

1,083,756. Connector for Electric Conduit. J. C. Phelps, Springfield, Mass. The ends and cover of the connector box are recessed to receive the pipe ends and lock nuts for same. (See cut.)

1,083,785. Process for Precipitation of Zinc. F. L. Wilson and S. E. Bretherton, Berkeley, Cal. Consists in adding zinc carbonate, ammonia and carbon dixode to the electrolyte to maintain the ionic strength thereof constant and to make the precipitation of zinc on the cathodes more uniform.



1,083,756.—Conduit Connector.

1,083,788. Loud-Speaking Telephone Receiver. C. Adams-Randall, Boston, Mass. Includes a resonator and a diaphragm composed of iron wires having different periods of vibration.

1,083,801. Jacquard. T. A. B. Carver, Glasgow, Scotland, assignor to Textile Appliances, Ltd., Glasgow, Scotland. Includes an electric needle-control device.

1,083,810. Electrohydraulic Controller. C. Engberg, assignor to Engberg's Electric & Mechanical Works, St. Joseph, Mich. Includes an electromagnetic puppet valve.

1,083,817. Electric Hammer. J. O. Fields and R. L. Fields, Zanesville, O. Includes special control for the operating solenoid.

1,083,822. Space Block. H. Geisenhöner, assignor to General Electric Co. Is provided with a notch and clip engaging in the notch and attached to one of the iron laminations of the core.

1,083,827. Shuttle Motion. G. G. Grower, Ansonia, Conn. Includes electromagnets to repel the shuttle from one end of the shuttle race to the other.

1,083,837. Means for Operating Electric Switch-Buttons. A. Kaufman, Savannah, Ga. A turning head is secured to the socket key and connected by a cord to a spring operating drum.

1,083,839. Ticket-Sales Register. A. Kiparski, St. Petersburg, Russia. Automatic electrical apparatus for independently registering the number of tickets delivered from individual boxes.

1,083,840. Automatic Ticket Registering and Indicating Device. A. Kiparski, St. Petersburg, Russia. Covers details of the electromagnet control for the above.

Patents Expired.

The following United States electrical patents expired January 12, 1914.

574,885. Controller for Electric Motors. H. P. Davis, Pittsburgh, Pa.

574,889. Electric Cigar-Lighter. J. W. Dawson, Louisville, Ky.

574,901. Telephone. C. C. Gould, Philadelphia, Pa.

574,903. Electric Meter. J. Hessberger, Niedersedlitz, Germany.

574,905. Electric Arc Lamp. R. O. Hood, Danvers, Mass.

574,914. Means for Adjusting Compound-Wound Dynamos. B. G. Lamme, Pittsburgh, Pa.

574,922. Electric Calendar-Clock. G. W. MacKenzie, Beaver, Pa.

574,926. Overhead Electrical Knife-Switch. J. Menchen, Kansas City, Mo.

574,953. Electrical Signal System. R. Skeen, Madison, Ill.

574,954. Electric Signal. R. Skeen, Madison, Ill.

574,978. System of Lightning Protection for Electric Circuits. A. Wurts, Pittsburgh, Pa.

574,979. Device for Protecting Electric Circuits. A. J. Wurts.

574,994. Printing Telegraph. B. Hoffman, Paris, France.

575,002. Illuminant for Incandescent Lamps. A. De Lodyguine, Pittsburgh, Pa.

575,045. Electric Valve Apparatus. J. V. Stout, Easton, Pa.

575,047. Electric Quick-Break Switch A. H. Armen, Philadelphia, Pa.

575,053. Electric Railway. L. Dion, Natick, Mass.

575,059. Bicycle Electric Bell. H. B Ewbank, Jr., Baltimore, Md.

575,065. Railway Signaling System. N. Henquin, Schenectady, N. Y.

575,072. Electrically Operated Piano Attachment. E. J. Simpkins, Toledo, O.

575,080. Trolley-Head for Electric Cars. W. S. Troutwine, Indianapolis, Ind.

575,093. Automatic Electric Marine Sounding Apparatus. J. F. Babcock, Bangor, Me.

575,099. Trolley Stand. J. E. Bishop, Indianapolis, Ind.

575,116. Direct-Current Dynamo-Electric Machine. M. Hutin and M. Leblanc, Paris, France.

575,131. Signaling Appliance for Telephone Switchboards. C. E. Scribner, Chicago, Ill.

575,156. Electric Bell. J. W. Holdsworth, St. Louis, Mo.

575,170. Electric Conductor. H. T. Richards, Brooklyn, N. Y.

575,176. Dynamometer. L. Schuler, Goppingen, Germany.

575,186. Telephone System. J. H. Weckel, Breakabeen, N. Y.

575,210. Dynamo-Electric Machine. G. L. Campbell, Kinsman, O.

575,231. Static Generator. A. J. Gawne, Sandusky, O.

575,235. Electric-Current Regulator. W. Hawker, Windsor Mills, Canada.

575,303. Electric Railway. G. W. C. Lomb, Birmingham, Ala.

575,311. Device for Picking Up Live Wires. H. O. Rockwell, St. Louis, Mo.

575,314. Electric Locomotive W. L. Silvey, Dayton, O.